INTERNATIONAL ABSTRACT OF SURGERY

VOLUME 75 SEPTEMBER, 1942 NUMBER 3

PRINCIPLES OF SURGICAL PRACTICE

THE MANAGEMENT OF OPEN WOUNDS AS EXEMPLIFIED IN THE PRESENT EUROPEAN COMBAT

LEWIS M. OVERTON, M.D., Des Moines, Iowa

THE evolution of the care of open wounds has to some extent been paralleled by the evolution of the methods of warfare. In the period when practically all combat was carried out with rifles, the problems presented were quite different from those encountered with the introduction of the high explosive shell. The former produced a clean wound with rarely any extensive surrounding tissue damage, while the explosive shell threw fragments of all shapes and sizes in every direction. Since the fragments were of a low velocity they carried particles of clothing and other debris into the wound. In addition to the marked contamination they produced, they also produced extensive deep-tissue disruption. Often the skin wound was small and appeared harmless, but the underlying tissues were badly mangled. During the World War from 1914 to 1918 practically all of the wounds were limited to the military personnel. However, with the improvements of the airplane and its introduction as a major combat weapon there was a marked increase in wounds from explosives. The wounds occurred wherever the raid had taken place. Often the greater number of casualties occurred among civilians. Since these persons were in or about buildings, most of the wounds were not produced by the shell fragments but were the result of penetration of missiles, such as brick, wood, and glass, and all of them were badly contaminated. Injuries of this type first appeared in significant numbers during the Spanish Civil War, but they increased rapidly to where they became the ones most frequently encountered, and hence received practically the whole attention of nearly all European writers. This may be explained by the fact that following the Spanish Civil War and prior to the Russo-German conflict, nearly all fighting had been in the nature of selective bombing with the exception of very short campaigns. The results were that a great majority of the casualties were in the civilian group. These badly contaminated and potentially severely infected wounds were most often encountered in individuals of unknown resistance and under adverse conditions. Thus new problems of major importance arose. This necessitated the training of civilian personnel in modern methods of first-aid as well as the development of a system for transporting the injured to emergency hospitals within the period of time that would allow them to obtain the best possible care. Such problems confronted the British Isles when they were first subjected to mass bombings. The rapid development of methods and facilities for adequately handling of the casualties is worthy of commendation.

One of the factors of primary importance in the management of every open wound is the prevention of shock, or if it is already present, to combat it as rapidly as possible. In order to accomplish this, certain general principles have been laid down by the medical departments of all military forces. These are essentially the same as those employed in civilian practice. The simple measures of keeping the patient warm, the immediate

Consultant, Broadlawns Polk County Public Hospital; Attending Surgeon, Iowa Methodist Hospital.

covering of the wounds with sterile gauze, relief of pain, control of hemorrhage, and splinting all severe wounds, whether accompanied by fractures or not, have been advocated. Certain wounds, such as open ones of the chest and abdomen, require immediate closure by packing and pressure bandages. The control of hemorrhage can be accomplished by pressure bandages in most instances and, if not, the tourniquet should be resorted to. However, the dangers encountered with the use of the tourniquet have been stressed by most surgeons. They believe that irreparable damage to the blood vessels locally often results in some embarrassment to the circulation in the injured area. If applied, the tourniquet should be released at regular intervals to lessen this danger as much as possible. Morphine is the best sedative for the relief of pain. Shaw (44) says that the dose should be sufficiently large to relieve all pain, while others recommend smaller doses at more frequent intervals, particularly in the more serious injuries. The dosage should be clearly marked on the record of every case. The administration of warm fluids by mouth in patients who have not sustained abdominal injuries, will restore some of the fluid lost by hemorrhage or shock. The use of intravenous fluids in the field seems to have little merit. The time lost in its administration and the temporary elevation in the blood pressure often make the hemorrhage more difficult to control, and thus counteract the beneficial effects. Once the first-aid has been administered, the injured must be transported to the emergency hospital with as little delay as possible. Upon admittance to the receiving ward, it becomes the duty of the medical officer in charge to classify each and every injury as soon as possible, sending it to the specified place with instructions for the proper treatment. Both the Spanish and British surgeons have learned that this responsibility should be relegated to the most competent man in the hospital because incorrect classification often results in unnecessary handling, increased shock, delay in the institution of treatment, increased infection, and increased mortality rates. The patients who are in a satisfactory condition for surgery are assigned for immediate surgery, the more seriously injured to receive attention first. Those who need resuscitation are sent to the shock ward where the shock therapy is continued. It has been stressed that the resuscitation should be as rapid as possible and operation deferred only until this has been accomplished. This can be best accomplished by the transfusion of whole blood when there has been hemorrhage, but in the cases in which the shock has been produced largely by the loss of fluids into the tissues, transfusions of plasma have often proved a life-saving measure. Grant and Reeve have found early rapid transfusions to be of increased value. However, Mitchiner, quoted by Robertson (41), has warned that too many transfusions may cause dangerous complications. If one adheres to the principle that the purpose of the transfusion is only to restore and help maintain the blood volume, such complications can be avoided. Intravenous administrations of saline and glucose solutions have been found to be of little value and, as a general rule, have been used only when blood and plasma are not available. The increased permeability of the capillary bed, which is present in severe shock and which allows the rapid escape of these fluids into the tissues, offers an explanation for their failure. Bailey (2) believes that the decision as to the best time to operate on such patients calls for a high degree of judgment and that the surgery must be planned to prevent a recurrence of a severe degree of shock.

The goal to be attained in all cases has been adequate attention to the wound during the first six hours; however, the experience of most surgeons has shown that a majority of the wounds could be treated with safety before the end of twelve hours. It has been agreed that the method of handling the wound changes as the elapsed time increases within this period, and the sooner the treatment can be instituted the lower will be both the morbidity and mortality rates. Therefore, one of the foremost purposes in the development of different types of emergency hospital systems in different countries has been the bringing of the wounded to operation as early as possible following the injury. The forward mobile hospital was the Spanish surgeons' solution to the problem. Toward the end of the war in Spain the time elapsed had been reduced to five hours in the hospital caring for the most urgent cases and to less than ten hours for those requiring a specialist's attention. In Jolly's (24) series of cases of abdominal wounds, the percentage of survivals was raised from 37 to 57 by the decrease in elapsed time. Bastos stated that if the transfer to a stationary hospital could be effected within six hours there would not be any need for the mobile hospital, but he further commented that this could not always be done, especially in the present type of warfare, which has been one of movement. Jeffrey's (23) experience with the British Expeditionary Force in France led him to conclude that the casualty clearing station must be a really mobile unit, capable of moving all of its equipment in an hour's notice. The disadvantages admitted by the

advocators of this system are that injuries, with the exception of those of the extremities which have already been immobilized, cannot be transported with safety for several days following surgery. This may produce a serious problem in war of rapid movement, especially in a retreat which would necessitate complete evacuation on very short notice. The general opinion among English surgeons has been that primary surgery on wounds should be carried out only in fixed hospitals. This has the disadvantage that the time elapsed may extend beyond the so-called safety period, but it may be more than compensated for by the improved working conditions, more complete equipment, and the absence of shock which would necessarily accompany early evacuation. However, the most important reason is that surgery in a fixed hospital can always be performed under the direction of a surgeon competent to carry out the treatment on the type of injuries to which he has been assigned. Cochrane (8) says that excision of the wound involving an extremity associated with a compound fracture and the application of skeletal traction should be carried out only in special hospitals by a trained personnel. Other writers have expressed similiar views.

When the patient arrives in the operating room it is most important that the operating surgeon know the type of missile which produced the wound, the general course and location of the missile, the type and extent of the wound, and the degree of shock which may have followed the injury, together with the measures necessary to combat it. The missile will most often determine the type of wound. If it has been a high velocity bullet the wound is more likely to be of the "seton" type, while shell fragments or those from blown-up buildings, by virtue of their low velocity, will produce much disruption of tissues and often carry particles of clothing and all types of debris in with them. Without this knowledge, one cannot estimate the damage to the deep tissues because the skin wound is often quite small and appears harmless. The course of the missile often reveals information concerning which tissues may have been injured. This may be determined by learning the position the patient was in when he was injured. This information should be obtained and recorded at the front. It may also be revealed by the roentgenogram unless the missile has been diverted by contact with the bone. The knowledge of the degree of previous shock and the resuscitation necessary to combat it will give the surgeon some index as to how much surgery the patient will tolerate and his work can be planned accordingly. His previous experience will tell him that patients who have recently recovered from shock will not tolerate a long drawnout operation. Gentleness and speed together with good judgment have been found to be the surgeon's chief attributes in handling such cases. The assigning of experienced surgeons to this work has been the real merit of the British system, and therefore favors the stationary hospital.

The choice of an anesthetic is very important in surgery on the severely injured. It has been the experience of all war surgeons that spinal anesthesia has no place in surgery on recent injuries; neither do these injuries do well under local or regional block. Probably the best explanation is that there is some increase in the shock produced by a dilatation of the blood vessels in the anesthetized area plus further disturbance of an already unbalanced nervous system. Gas-oxygen has been found to be safest by those with war experience and thus it has become the anesthetic of choice. The barbiturates, given intravenously, have had limited use. The majority of those who have employed them speak favorably; however, they warn that they should be used only by the experienced anesthetist.

The local care of the wound is begun by the usual mechanical methods of thoroughly, but gently, cleansing the surrounding skin with soap and water, and with the usual precaution to protect the wound during this operation. The use of skin antiseptics is not advocated. The wound should then be draped carefully and the necessary surgery instituted. The consensus has been that the excision of the skin wound should be as economical as possible, but that the opening should always be enlarged sufficiently to allow free access to the deep wound. The manner of treatment of the wound itself will be determined by the time elapsed since the injury. All contributors advocate the complete excision of all wounds of six hours' or less duration, and in all of twelve hours' duration in which definite infection has not developed. On the other hand, they believe that all wounds more than twelve hours old have passed the stage of contamination and must be handled differently. In the early wounds, complete excision should be carried out, with removal of all devitalized tissues and foreign bodies. The muscle should be removed down to the bleeding healthy tissue. All sinuses and crevices must be explored and adequately enlarged, and care must be taken to open and evacuate all hematomas. All foreign bodies and loose fragments of bone should be removed. However, in wounds about the face a more conservative attitude has been found to be of advantage. Some authors, especially the Ger-

mans, believe that the removal of tissue from any wound should be limited to the removal of that which is obviously nonviable, and that attempts should not be made to remove the foreign bodies unless they are easily accessible. The British, French, Spanish, and other surgeons believe that complete wound excision is the only adequate treatment. Bailey (2) states, "The essence of surgical treatment is excision of the tissues lining the tract of the wound." This means that every crevice must be explored and adequately handled. Thus, it becomes evident that the primary objective is the removal of all damaged tissue and when this has been accomplished the foreign body becomes accessible and can be easily removed. In carrying out the excision, one must not be too concerned about the sacrifice of tissue, because this is more apparent than real and the functional loss will be infinitely small as compared to that following gross infection. However, caution must be exercised that no further damage is inflicted on the blood vessels, tendons, nerves, and other vital structures. Here again one must be warned not to let consideration of these structures cause inadequate attention to any part of the wound.

The principle of complete wound excision applies to all types of wounds except those in which there has been little or no disruption of tissue. In such cases complete excision is not necessary; experience has shown that excision of the orifice and exit is sufficient to insure primary healing.

The wound of more than twelve hours' duration, in most instances, has passed from the stage of contamination to that of infection and requires different treatment. Excision will no longer accomplish its purpose and may even produce grave consequences. All continental surgeons are in agreement that any operative intervention in the infection must have a definite purpose and this must be accomplished with as little damage as possible to the living tissues. Any vigorous movement, squeezing, scraping, or rubbing may release toxins or bacteria into the blood stream, or it may detach a thrombus. The comparatively quiescent wound can best be treated by watchful waiting. If, on the other hand, there is unusual tenderness associated with pain when at rest and a feeling of tension, one must suspect a deep infection, frequently anaerobic in nature. A roentgenogram will show the presence of gas bubbles and localize the foreign body. The purpose of surgery in such cases is only to promote free drainage and remove the obviously dead tissues. It has occurred to the author that the method used by Dickson and his associates (14) may have some merit if used in these cases.

Bailey (2) has laid down definite principles to be followed in the management of the infected war wound. If they are observed much grief may be avoided. These principles are as follows:

1. On no account should wound excision be attempted after from eighteen to twenty-four hours.
2. Operative treatment should be limited in scope and gentle in execution.
3. Incision may be required to obtain access, and for drainage.
4. Blood clots, foreign bodies, and obviously devitalized tissue must be removed without damage to the living wall of the wound.
5. Attend to hemostasis.
6. Damaged muscle should be treated on the lines indicated (excision), up until contractile bleeding muscle is reached.
7. Free drainage is imperative.
8. Irrigate with a mild antiseptic such as hydrogen peroxide.
9. Do not use tubes for drainage. Pack lightly with vaseline strips leading to the surface and use Carrel-Dakin technique.

The primary suturing of tendons and nerves has been found to be impractical in war surgery. Since the great percentage of wounds resulting from enemy action must be treated by the open method, and because the small number which can be closed have some drainage, the feeling has been that suturing of tendons and nerves should be delayed until the wound has healed. Mercer (31) and some others believe, however, that repair of these structures can be carried out with relative safety in wounds encountered within the first six hours, provided the tissue loss has not been extensive.

The treatment of the open wound has been about one-half accomplished when the excision has been completed. The aftercare of the wound must be just as thorough and complete as the surgery if a good result is to be expected. In the first instance, every effort must be made to prevent edema of the wound, which if allowed to develop results in local congestion and ultimate death of the surface tissues by starvation. It is obvious that such a condition produces an ideal field for the development of infection. Bailey (2) has aptly stated, "The two great principles that have emerged from the modern methods of the treatment of the excised wound are, tissue support to control edema and immobilization sufficient to give complete rest to the injured part."

There has been little variance of opinion as to whether or not the wound should be closed at the time of the excision. Some believe that the wound which has been converted into a relatively aseptic

one early, and the wound in which there has been such little tissue loss that the edges can be approximated without tension, may be closed with safety. If such a wound is to be closed, buried sutures and drains of all types should be avoided because they prevent apposition of living tissues. According to Bailey (2), experience of war surgery dictates that there must be no buried sutures and no tension on any sutures, but that all space in the wound must be obliterated. Cochrane (8) believes wound closure may be practiced safely up to twenty-four hours if these factors exist and the patient is not to be evacuated. Odelberg (33) advocates the suturing of the wound within the first twelve hours if the wound excision can be considered complete, but he warns that no deep sutures should ever be used. Weddell (52) believes that a considerable number of wounds can be closed within the first twelve hours but that the procedure requires the judgment of an experienced surgeon and must be carried out only under the best aseptic conditions. He warns, "To close an inadequately excised wound is to subject the patient to a very grave risk to the part or even to life."

While nearly all authors agree that certain wounds may be closed primarily, they believe that it is best not to close any of them in military surgery. The British surgeons generally are of the opinion that certain wounds may be closed only if the procedure can be carried out by the most experienced surgeon in a fixed hospital where evacuation would not be necessary and the after-care can be supervised by the same surgeon. The sector surgeons of the base and evacuation hospitals in the Spanish Republican Army were unanimous in condemning primary suturing of wounds after excision.

It has been definitely established that wounds which have not been sutured primarily must be supported to prevent edema and subsequent decreased local circulation. Orr's experience has taught us that the best method of accomplishing this is by packing the wound open with some form of gauze and taking care that all cavities and crevices are also packed. The packing must be firm enough to accomplish complete support of the wound, but at the same time not so snug that it will produce any circulatory disturbance. In addition to accomplishing this, the pack will allow free drainage. The general opinion has been that drainage tubes are unnecessary with this type of treatment, although there are a few who think it best to place tubes in the deep cavities and crevices and allow them to project through the pack. There has been some diversity of opinion as to the choice of material for the pack. The vaseline gauze of Orr has been favored by many. Trueta prefers plain gauze, but the British surgeons object to it because they found that the wound granulation tissue grew through the mesh of the gauze and made it very difficult to remove. Their choice has been flavine-soaked gauze. Recently, however, gauze soaked in honey and cod-liver oil, to which has been added equal amounts of sulfanilamide and sulfathiazole, has been found to have advantages over all other material.

Once the wound has been adequately dealt with, the problems of dressings and rest arise. Experience has proved that the less a wound is disturbed the smoother and shorter will be its convalescence. This principle, that the wound not be dressed any more often than is absolutely necessary and that it be completely immobilized between each dressing, must be followed to accomplish rapid convalescence. Frequent dressings not only disturb the healing process, but also invite secondary infection. Bacteriological studies by Miles (32) in wards of injured soldiers have shown that the origin of bacteria making their appearance in frequently dressed wounds was in the wound of some other soldier, or in the nose and throat of the person who had dressed the wound. He felt this was definite evidence that the organism had been transferred at the time the dressings were changed. The organisms found were not so haphazard as would be the case if they had entered the wound at the time of its infliction, nor would the predominating type which was present after three weeks likely have been dormant there for that length of time.

All British and Spanish surgeons have agreed, without reservation, that complete immobilization is necessary for adequate wound rest. The most efficient method of accomplishing this has been the complete encasement of the part in plaster-of-Paris when possible (the so-called closed plaster method). The method was developed by Orr during World War I and used in the treatment of compound fractures. Trueta employed the same method early in the Spanish Civil War for all soft-tissue wounds of the extremities as well as for all compound fractures. The only change from Orr's technique was that the plaster was applied directly on the skin and over the wound packing with no other dressing or padding. The results were so favorable that it has since been employed as the standard treatment by most military surgeons. However, some of the French have felt it should be used with prudence, because it involves the danger of "enclosing the wolf in the

sheep fold." Even the British were somewhat slow in accepting the method wholeheartedly.

As Trueta has stressed, the complete immobilization of the wound in plaster-of-Paris rests the tissues, prevents the temptation of frequent dressings, and aids in the control of edema; and thus it lessens the lymph flow. Since the spread of infection is through lymph channels and not the blood stream, as shown by Trueta and Barnes (49), the decrease in lymph flow will tend to keep the infection localized. This treatment was employed almost universally in the Spanish Republican Army in 1938. During that year, approximately 20,000 individuals were treated by this method. The incidence of gas gangrene, as well as of other infections, fell so markedly that it was suggested that the Spanish soil did not contain any anaerobes. D'Harcourt and his associates (13) reported the complete results in 5,000 of this group. Of 37 deaths, 15 were due to gas gangrene, 5 to secondary hemorrhage, and 17 to septicemia. In Trueta's own cases which numbered 1,073 open fractures, there were 6 deaths. Good results were obtained in 976, and bad results in 91. Jolly (24), after an experience of twenty months in the Spanish War, is convinced that the closed plaster method is the one of choice for treating all soft-tissue wounds of the extremities, as well as compound fractures. He believes that the complete immobilization was a definite factor in lowering the incidence of gas gangrene as well as of other infections. Odelberg (33), writing on his experiences in the Russo-Finnish War, reported excellent results with the closed plaster method of immobilization. The British surgeons, although slow to accept the method at first, have gradually increased its use until now it is practically the universal treatment. Jolly (24) states that the early skepticism was probably due in a large part to the recollection of the horrors of gas gangrene in World War I and in part also to the fact that in the early months of the present war the opportunity to treat a great number of war fractures and to observe the results of different forms of treatment did not arise. This no doubt will also explain the reaction of the French surgeons. Bailey (2) writing recently, states that the method has advantages so great that no opportunity should be lost of gaining experience in its use. However, he believes it is still on trial and that certain conditions are necessary to insure the safety of the wound. First, the wound excision must be complete and it must be carried out within the first six hours after the injury; and, second, the blood supply of the limb must not be in doubt. He further states that the chief danger in the method is that with the wound hidden from view a spreading infection may not at once be apparent. Cohen and Schulenburg (9) reported 84 gunshot wounds which had been treated in plaster with no deaths; healing was very satisfactory. They were impressed by the excellent condition of the patients. They were comfortable, contented, and had good appetites. Rose, reporting on 128 cases, 24 of which were compound fractures and perforating joint wounds, obtained excellent results with immobilization in plaster. There was much destruction of the muscles and skin in every case. Matthews (27) says that closing of the wound in plaster is done extensively, but he believes it is not the correct method in large cities because the limb needs constant, careful watching, and a tragedy can so easily occur when the patient passes from the care of one hospital to another some distance away. He prefers to make a window over the wound so it may be dressed each day. His method is to remove the gauze and spray the wound with sulfanilamide, then to repack it with dry gauze. His experience has been that healing occurs quickly. This report is of interest in view of the general conception that windows in casts predispose to local edema of the wound and the frequent dressings invariably produce secondary infection. Therefore this procedure is not in keeping with the modern handling of wounds. It is most likely that sulfanilamide prevented the recurrence of infection.

D'Harcourt (13) advises that all infected wounds be encased in plaster. He says that after débridement and saucerization have been carried out, the cast obviates the ordeal of frequent dressings, and the risk of secondary infection and absorption of toxic proteins from tissues resulting from the disturbances caused by constant movement during treatment. Most English surgeons favor the treatment of these wounds by the open method, preferably that of Carrel-Dakin, until the acute infection has subsided, after which they employ the closed plaster method. Patients arriving at the American Hospital in Britain who had been treated by the closed plaster method were found to be in unusually good condition by Wilson (53) and Cole (10). These casualties were received from a few days to several months after the injury. With only a few exceptions, the wounds were found to be healthy and granulating nicely. It was also found that the position of the fractured bones was good except in those cases involving the shaft of the femur. The position of the fragments had been lost in most of these fractures. Even though Trueta had advocated the treatment of femoral-shaft fractures by this method, these men

believed they could not maintain reduction by plaster fixation alone. If reduction was not satisfactory at the time of admission to this unit, the casts were removed, the wounds were exposed by removal of the pack and cleansed, and the fractures were reduced. Reduction and immobilization were maintained by the direct bone-fixation method of either Anderson or Harris. The wounds were repacked and plaster-of-Paris was reapplied to produce complete wound immobilization. Excellent results were reported even in wounds which came under their care as late as four months after the injury. As a result of their experience, they believe that the closed plaster method has proved invaluable in the management of war wounds involving the extremities, and that it can be employed in the primary care of fractures with good results, except in those of the femoral shaft.

The value of immobilization of the wound in a complete plaster-of-Paris cast has been summarized as follows by Trueta:

1. Rest allows local venous and capillary thrombi to form. These prevent and delay the spread of infection and are not broken down by repeated handling.
2. Rest allows new capillaries to form, which are not torn by repeated dressing of the wound.
3. The plaster maintains a constant beneficial pressure on the wound; the calcium in it may be of local value.
4. This pressure also prevents edema and thus retards the flow of lymph and the spread of infection.
5. The mixture of organisms on the wound may by their mutual antagonism prevent the victory of any one group.
6. To leave the wound uncovered, as advocated by Schede and Bohler, is good treatment for superficial wounds; but in the deep wounds produced by shells and aerial bombs, the dehydration and loss of heat which result from this treatment induce a condition of shock inimical to the general well being of the patient and to the healing of the wound.

Satisfactory results with the use of the closed plaster method necessitate the adherence to certain fundamental principles. The plaster must be applied directly to the wound surface and skin, without any other dressing or padding. The cast must not be changed too frequently, at not less than three-week intervals if possible. The occurrence of some systemic reaction with each change of cast is not an indication to remove it. The usual reaction is that of an elevation in temperature. This may go as high as 104 degrees but will gradually subside after a few days. During this period the patient will be in good general condition and there will be no undue pain or tenseness in the wound. Trueta warns that it is necessary to avoid premature removal of the cast because of discomfort, rise in temperature, and enlarged lymphatic glands, since all of these symptoms are but an expression of the intensity of the struggle which is taking place at the site of the wound. The making of a window or, even worse, removal of the cast, will exacerbate the local infective process. It is just the cases in which the cast is removed which are supposed to prove the advantages of antiseptic treatment and to discredit the closed plaster method. It is impossible to prove that the general infection which follows removal of the plaster is due only to premature surgical intervention; however, statistics show that if the cast is let alone, localization of the septic process will be established in nearly every case. If listlessness, a rise in pulse rate, intense pain in the region of the wound, and edema of the distal portion of the extremity accompany the rise in temperature, the cast must be removed and the wound examined. At this time it will usually be found that the treatment prior to the application of the cast had not been complete in that adequate drainage had not been established. This condition must be combated by re-establishing free drainage, carefully repacking the wound, and reapplying the plaster.

The use of antiseptics had been opposed in the care of the open wounds until the introduction of the sulfonamides. At the present time, most authors on war surgery favor their use. However, experience has not been extensive enough for many statistical reports. Wilson (53) stated that sulfanilamide had been used in the primary care of wounds which came to them later, but that its use had not been routine. The first mention of its use was by D'Harcourt (13) in 1938. Jeffrey(23) advocated its use locally while in service with the B.E.F. in France in 1940. The procedure followed was that of spraying sulfanilamide powder into all depths and crevices of wounds. These wounds looked cleaner after a five-day interval than those in which the drug had not been used. Three septic knee wounds were debrided and sulfanilamide was implanted into the cavities. All of these cases ran an afebrile course and had no serious local infections. The wound of a compound depressed skull fracture the size of a hen's egg remained clean and the patient afebrile after the local use of sulfanilamide. Bickford (3) reported 2 cases in which gravely lacerated wounds were excised, packed with sulfanilamide, and sutured loosely. Healing occurred without infection. He thinks

that the drug may be of especial value in the handling of wounds which cannot be efficiently débrided. The author warns that the use of the drug should not cause the surgeon to lessen thoroughness of wound excision in any way. Hawking (20) made some interesting observations on the concentration of the drugs in the wounded area. The study included the determination of the concentration of the durg in the wound cavity, in the distal parts of the wound, and in the living and dead tissues forming the sides of the wound. The work was carried out by making comparisons between sulfanilamide, sulfathiazole, and sulfapyridine. The results indicate that sulfanilamide has the advantage of higher local concentration, greater penetration and diffusibility, but the disadvantage of rapid disappearance from the wound and of lower bacteriostatic activity. Sulfathiazole persists in the wound for a longer time and its bacteriostatic activity is much higher than sulfanilamide, but it has the disadvantage of lower concentration in wound tissues and lower diffusibility, while sulfapyridine has lower bacteriostatic activity, concentration, and diffusibility. The concentration of the drug is always very low in the living tissues forming the wall of the wound. Brown (6) found that when 1.6 gm. of sulfanilamide were implanted in thoracic wounds, the blood concentration rose to between 2.5 and 3 mgm. per cent, but his conclusions are that the response to local use is more than can be expected from the general effect. Clinical studies by Pfister (39) with sulfapyridine gave good results. Large quantities of the powder were placed in the wound. The work shows that the very slow rate of absorption prevents the development of any toxic manifestations. Thrower (47) concurs in this opinion but warns that the dosage must be adequate to obtain results to avoid the late side effects and to prevent drug fastness. Cole (10) thinks that sulfathiazole had definite advantages over the other preparations in the dressing of wounds in patients who had been evacuated to the American Hospital. He also believes that these drugs prevent some of the usual reactions encountered in removal of the old packs and insertion of new ones. With the exception of this one unit, all of the clinical data to be found are on sulfanilamide and sulfapyridine. This no doubt is due to the inability to obtain sulfathiazole and sulfadiazine. There is general agreement with the American workers that the higher local concentration obtained by the local use of the drugs gives better results than those following its general administration. However, it is also believed that the combination of oral and local administration produces considerably better results.

In addition to lowering the incidence of mixed infection, these drugs also exert a favorable influence on the anaerobic organisms, particularly the clostridium welchii. Bonnin and Fenner (4) showed by guinea-pig experimentation that sulfanilamide, when administered locally, controlled infection with clostridium welchii and vibrion septique, but had little effect on the clostridium oedematiens.

The favorable reaction of the drugs has caused some authors to suggest that each soldier carry on his person a supply of one of the preparations, preferably a combination of sulfathiazole and sulfanilamide. Immediately upon being injured he should pour the powder into the wound and apply a dressing. It has been thought that this would retard the infective process sufficiently to allow complete wound excision after a much longer interval, probably up to between twenty and twenty-four hours.

Three thousand units of antitetanic serum were administered to every casualty with an open wound in the Spanish Republican Army. In France where 2 doses of tetanus toxoid had already been administered to the army personnel, another dose was administered at the time of the injury. It was thought that this increased the defensive powers against the organism. The nonvaccinated wounded were given 1 cc. of the toxoid at the time of the injury and forty-eight hours later this was supplemented by 3,000 units of antitoxin. The problem in the British Isles was different in that most of the casualties were in the civilian group as the result of aerial bombardment. Since there had been no opportunity to produce active immunization in these cases, everyone was given 3,000 units of the antitoxin with the realization that many might already have been immunized.

Gas-bacillus infection and ultimate gas gangrene have received much consideration. Memorandum No. 2 of the Medical Research Council outlines completely the factors which must be considered in the management of open wounds in order to lower the incidence of infection, which in turn will prevent gas gangrene in most instances. It stresses that the most essential prophylactic measure is complete wound excision. More recent results have indicated that the use of the sulfonamides, both locally and orally, has materially lowered the incidence and severity of the infection. As stated previously, the work of Bonnin and Fenner (4) shows sulfanilamide to have a definite bacteriostatic effect on the clostridium welchii and vibrion septique. Other prophylactic measures include the injection of polyvalent gas serum, with 3,000 units of the clostridium welchii, 1,500 units of the clostridium septique, and 1,000 units

of the clostridium oedematiens antitoxin, given either intramuscularly or intravenously. Penfold, Tolhurst, and Wilson (38) carried out some clinical experiments on the active immunization against the bacillus welchii using an alum-precipitated toxoid. It was found that a sharp increase in the antitoxin titer could be produced in the small series of cases. Considerably more work will be necessary before we can determine the value and rationality of employing this toxoid as a prophylaxis against gas gangrene.

When there is any suspicion of gas-gangrene infection of the muscle, the wound must be opened widely and the muscle or group of muscles ruthlessly excised, whatever the lapse of time since the injury. Under some circumstances, amputation may be the sole surgical method capable of saving life. The work of Henderson and Gorer (21) has shown that the best available treatment to supplement the surgery is the administration of a combination of the sulfonamides and antitoxins. These authors believe that the combined action (probably synergistic) is much more effective than that obtained by either method alone. They mention only the use of sulfapyridine and sulfanilamide, but recent reports have revealed sulfathiazole to be more effective than either of these. Broster (5) reports that patients with gas-bacillus infection who received sulfonamide therapy survived, while those not receiving it died. Matthews (27), in reporting 10 cases of gas gangrene, did not have any deaths; all of the patients received sulfanilamide orally and locally in conjunction with the antitoxin.

Wounds in certain locations require some special considerations which vary from the management of wounds as a whole. However, even in these wounds the general principles of preoperative preparation and after-care are the same. In wounds about the face, including compound fractures of the facial and jaw bones, wide excision is not advisable. McClure (28) says there is little place for excision of wounds about the face. It has been his experience that it is impossible to close cuts in the mucoperiosteum of the mouth and air sinuses; therefore, continuous contamination must occur. McIndoe (29) stresses the same conservative treatment, explaining that the profuse blood supply is a factor in the resistance of the facial tissues to infection. He advises removal of only the obviously dead tissues and foreign bodies, with precaution to preserve all the skin possible and not to remove any bone unless it has been completely detached from its periosteum. The obvious reason is that excessive removal of tissues in this area makes plastic reconstruction difficult, if not impossible. It is safe to close the wound within the first twelve hours if it has been cleansed thoroughly and all foreign bodies have been removed, but here again the general technique of suturing must be followed. All compound jaw fractures should be adequately drained. Drainage must be dependent and aided by a rubber tube sufficiently wide to allow frequent irrigation to alleviate blocking. The postoperative immobilization is just as important in these wounds as elsewhere. Converse and Waknitz (11) have developed a bone fixation apparatus which accomplishes this very nicely.

Chest wounds of the penetrating or perforating type which have not produced extensive tissue destruction or intrapleural hemorrhage of a sufficient degree to produce severe shock, should be treated conservatively. The excision should be limited to the orifice and exit, and the pleural cavity should not be opened. However, if the wound has produced an open pneumothorax it is imperative that this be closed at the earliest moment. The immediate first-aid must accomplish this by packing and pressure bandage. The wound should not be disturbed further until the patient has been made ready for surgery and, if possible, after positive-pressure anesthesia has been initiated. Upon completion of the operation the deep portions of the wound must be closed. There is considerable variation in opinion on the advisability of closing the skin; the majority favor packing it open.

Abdominal wounds constitute the most urgent emergencies of all war wounds. Cope (12) says it is not necessary to operate in every case, but it is essential that this decision be left to the experienced surgeon who is capable of determining the damage within the abdominal cavity. If every patient who has been wounded in the lower abdomen or pelvis is catheterized, many calamities will be avoided. Every case in which there is a rupture of a hollow viscus or serious hemorrhage should be explored. The time lapse between the injury and surgery is most important, not only to prevent infection but also to preserve life. In Jolly's (24) experience the reduction of the time elapsed to six hours or less increased the survivals from 37 to 57 per cent in 243 consecutive cases. It is his belief that there is a definite rise in mortality after six hours and that this increases in proportion to the increased interval.

Joint wounds in which there is no fracture into the joint may be excised up to twenty-four hours following their infliction, according to Jolly's experience. The explanation for the prolonged safety period is that the synovia offers a barrier to the invading organisms and thus makes it possible

to carry out a complete operation after a greater time interval. The procedure includes thorough irrigation of the joint followed by a closure of the synovia, if possible. It is thought generally that the remainder of the wound should be packed open and the closure carried out at a later date. On the other hand, if the joint injury has been complicated by bone injury, it must be handled as all other compound fractures. This necessitates the sacrifice of the joint in most instances.

SUMMARY AND CONCLUSIONS

1. Modern warfare has confronted us with many new problems. The extension of casualties to include large numbers of civilians, the rapid movement of the fighting forces, and infiltration military tactics have produced difficulties in applying first-aid and in the transportation of the injured to emergency hospitals.

2. The first-aid care of wounds resulting from enemy action should be limited to the fundamental methods. The simple methods of controlling shock, such as controlling hemorrhage, relieving pain, keeping the patient warm, and splinting, produce the most satisfactory results. The care of the wound itself has been limited to covering it with sterile gauze and bandaging. The patient is then transported to the emergency hospital with the least delay.

3. Complete excision of all wounds encountered within the first twelve hours has been advocated, with the exception of those in which there has been no tissue disruption or those involving certain structures. On the other hand, those coming to surgery after twelve hours demand more conservative care. The surgery in such cases has been limited to removal of the obviously dead tissue and foreign bodies and the establishment of free drainage.

4. Primary tendon and nerve suturing has not been advocated. The frequency of infection which resulted in the failure of such a procedure has been sufficient to advise against it.

5. The experience of the majority of surgeons has been that it is dangerous to close war wounds primarily. On the other hand, the support of all parts of the wound by some type of gauze pack has given satisfactory results.

6. Good after-care of the wound demands support and absolute rest. It has been learned that complete encasement of the wound and regional structures in plaster-of-Paris has best accomplished this purpose. The plaster is applied directly to the wound and surrounding skin. The wound is not disturbed until healing has begun; this period should be at least three weeks.

7. The use of the sulfonamides, both local and general, has been found to be of definite value in the care of war wounds. The statistics, although not large, have been sufficient to establish the value of these drugs.

8. The most effective means of combating gas gangrene has been complete wound excision followed by support and rest. Recent reports indicate that the sulfonamides may further lower the incidence of this infection.

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EXTRADURAL HEMORRHAGE

A Collective Review of the Literature and a Report of 30 Cases of Middle Meningeal Hemorrhage and 4 Cases of Dural Sinus Hemorrhage Treated Surgically

E. S. GURDJIAN,[1] M.D., F.A.C.S., and J. E. WEBSTER, M.D., Detroit, Michigan

EXTRADURAL hemorrhage or a collection of blood between the skull and the dura is a fairly common complication of craniocerebral injury. Extradural hemorrhage may originate from rupture of (1) the middle meningeal artery (Fig. 1), (2) the dural sinuses (sagittal sinus, lateral sinus), and (3) the diploic and emissary vessels. The middle meningeal artery is the commonest source of this lesion. Dural sinus injury with resultant extradural hemorrhage is uncommon, and diploic and emissary vein bleeding rarely causes such a lesion of surgical proportions. Thus, this material is designed to emphasize, primarily, the various features of middle meningeal hemorrhage. The paper is based upon a careful review of the literature and upon the conclusions derived from a study of 30 surgically treated cases of middle meningeal hemorrhage, 3 cases of lateral, and 1 case of superior longitudinal-sinus hemorrhage.

MIDDLE MENINGEAL HEMORRHAGE

Extradural hemorrhage of middle meningeal origin occurs in about 3 per cent of the cases of head injury (Munro, 75). It is usually unilateral. In some cases there may be relatively little involvement of the remainder of the intracranial contents. A typical case of middle meningeal hemorrhage follows a definite pattern of symptoms and signs. The classic syndrome of a short period of unconsciousness followed by a lucid interval, the latter followed by secondary unconsciousness and focal signs, is characteristic and has been recognized for the past seventy-five years. However, many bizarre clinical variations of this pattern may be seen because of associated intracranial damage or individual variations and responses. Also, other intracranial lesions may cause similar signs and symptoms.

Fig. 1. Example of extradural clot due to a fall seen at the post-mortem table. The child, thirteen years old, fell off a bicycle and struck his head on the curb. He walked home, arriving at 6:30 p. m. At 9:30 a. m. he expired. (From a paper to appear in *Surgery*).

Anatomopathology. The middle meningeal artery, which is the chief source for the blood supply of the cranial dura, almost always enters the cranial cavity through the foramen spinosum, and in 57 per cent of the cases it divides into the anterior and posterior branches at the foramen (Plummer, 81). In the remaining group, according to Steiner (91), the artery runs along the greater wing of the sphenoid for from 1 to 5 cm. before dividing into its anterior and posterior branches. At times, the anterior branch may enter the cranial cavity through the superior orbital fissure, arising from the ophthalmic artery in the orbit. In such cases, the foramen spinosum may be completely absent, or, if present, a small artery (the equivalent of the posterior branch) may traverse it. In 60 of 100 cases, the anterior division traversed the greater wing of the sphenoid for a distance of from 1 to 3 cm. in a bony canal. The anterior division is usually larger and appears to be the continuation of the main trunk. Both branches divide to supply the lateral surface of the middle two-thirds of the cerebral dura. The meningeal artery in its course in the meningeal grooves is accompanied by two or more veins on either side surrounding the artery. This is well brought out by Jones (51, 52) who believes that

[1]Assistant Professor of Surgery, Wayne University College of Medicine; Associate Attending Surgeon, Receiving Hospital.

middle meningeal hemorrhage is frequently a venous hemorrhage, and that it is much easier to tear or damage the thin walled veins than the well protected artery. That there is associated venous bleeding in most cases of middle meningeal hemorrhage cannot be denied.

The mode of production of middle meningeal hemorrhage is probably as follows:

A fracture line may lacerate the meningeal vessels in the groove and cause a small hemorrhage in the epidural space. The hemorrhage may start a separation of dura from the bone which becomes more and more extensive as the bleeding continues. In some cases, a separation of the dura may obtain without fracture, but this is rare. An epidural clot may thus be started which may cause further separation of the dura associated with more bleeding from newly torn meningeal vessels (Bell, 7). Laceration of the meningeal artery and veins by depressed pieces of bone is possible; in fact, in our series 6 cases of middle meningeal hemorrhage were associated with depressed fractures. Perforating wounds have been known to cause middle meningeal hemorrhage (Guthrie, 41).

The clot formed is usually dark and appears like grape jelly. It is frequently discuslike in shape and may vary in size. At the post-mortem table, the largest seen by Vance (95) weighed 300 gm. In the series of Moody (73), the largest weighed 246 gm. The clot, according to Kroenlein (58), is found most commonly in the temporoparietal region. Frontotemporal and parietooccipital sites are next in frequency (Fig. 2). Frontal extradural clots have been described (Jefferson, 50). McKenzie (72) emphasized that the clot may extend from the parietal region posteriorly over the cerebellar lobe and should be looked for in that position in some cases. The fact that the hemorrhage is almost always associated with a fracture and that the fracture is usually adjacent to the clot makes it reasonable to look for a suspected extradural hemorrhage in the vicinity of the fracture. Trepanation along the course of the fracture line in suspected cases of extradural hemorrhage is reasonable and justifiable. However, many cases of extradural clot of middle meningeal origin without fracture have been described in the literature (Auvray, 3, Erichsen, 28, and others).

The size of the clot is not proportional to the severity of the symptoms. In some cases a small clot may be associated with early death; in others a large clot was present for several days and even weeks before death (Jacobson, 49, Moody, 73, and Vance, 95).

Associated damage to other parts of the brain may be frequent. Bruises and lacerations of the temporal and frontal poles have been seen. Moody (73) emphasized the occurrence of massive temporosphenoidal hemorrhage on the same side as the extradural lesion. Subdural hemorrhage frequently accompanies extradural hemorrhage (Pringle, 83). Subarachnoid hemorrhage is quite common. In 2 cases in our series, there were associated subdural accumulations of spinal fluid. In 7 cases, there were subdural hemorrhages. In 3 of the operated cases, there were massive temporosphenoidal hemorrhages.

Extradural hemorrhage of middle meningeal distribution is almost always unilateral, although bilateral instances have been described. One of the earliest cases of middle meningeal hemorrhage recorded in the literature is an example of bilateral hematomas. The patient was operated on by Hill (43) in 1750. First one side was explored four days after injury and then the second side, three days later. The patient recovered and was well twenty years later. Bilateral lesions have been reported by Pringle (83), Roy (86), Wiesmann (102), and others. One instance occurred in our series (Fig. 3, a, b, and c).

Etiology. Middle meningeal hemorrhage is commonly seen in young adults and those in the middle age group. Its occurrence in the newborn is rare. Various reviews on birth injuries do not discuss the subject of hemorrhage into the extradural space (Alpers, 1, Rivière, 85, and others). Ballance and Ballance (6) described a case of extradural hemorrhage of middle meningeal origin at birth due to a depressed fracture of the left

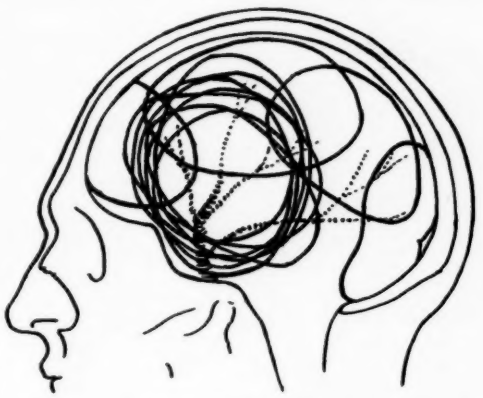


Fig. 2. Position of 13 extradural clots seen at autopsy in 151 consecutive cases. Note that the greatest majority occur in the temporoparietal region. (From a paper to appear in *Surgery*.)

Fig. 3. a. Fracture line extending from one temporal region to the other, crossing the vertex.

frontoparietal region. There were no localizing signs. Operation on the twelfth day was followed by recovery. A good deal of the collection was in a fluid form in the epidural space along the course of the middle meningeal artery. Lefkowitz (60) described an extradural hemorrhage of middle meningeal origin due to birth injury. The baby was delivered by version and extraction. At birth, the infant did not breathe spontaneously and was cyanotic. There was a fracture of the right humerus. Roentgen study showed no fracture of the skull. The spinal fluid was bloody and there were generalized convulsions two days after birth. On the fourth day there were twitchings of the left side of the face. On the sixth day the temperature rose to 105 and death occurred. At postmortem examination, a discus-shaped extradural mass was found in the right temporoparietal region. There was slight subarachnoid hemorrhage at the right sylvian fissure and a small subdural clot along the tentorium cerebelli. No fracture of the skull was found.

Extradural hemorrhage in infancy is also rare and review of the literature reveals few instances of hemorrhage in the middle meningeal distribution. Wakeley and Lyle (98) discussed the case of a patient fourteen months of age who fell from a first story window to the pavement, a distance of 18 feet. The child was unconscious ten hours later, with a pulse of 66. No physical findings were reported but a left temporoparietal, extradural clot was removed at operation. Recovery obtained. In another case (Goode, 31), an infant of thirteen months fell from its mother's arm, a distance of four feet, and struck its head. Two hours later, the child was unconscious. There were twitchings of the left side of the face, left arm, and eventually of the left leg. Later, the patient became paralyzed in the left half of the body. The eyes were turned to the right. The child was operated upon and a large extradural clot was removed from the right temporoparietal region. The case of a child, three and one-half years of age, who fell from a swing and died in

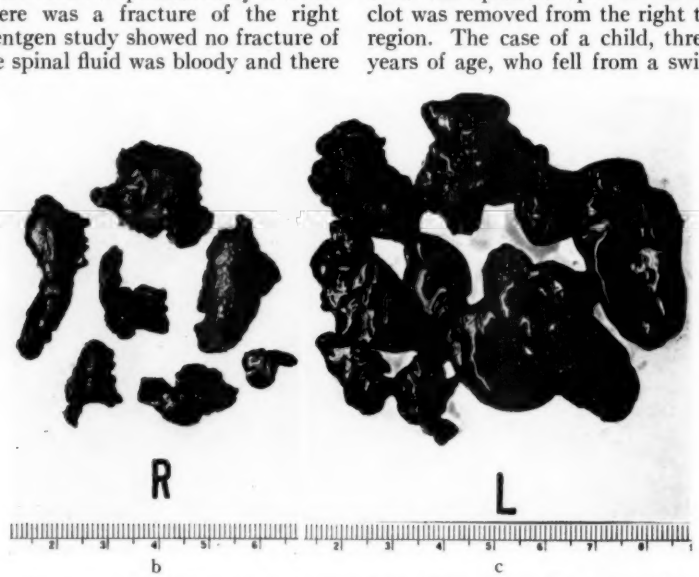
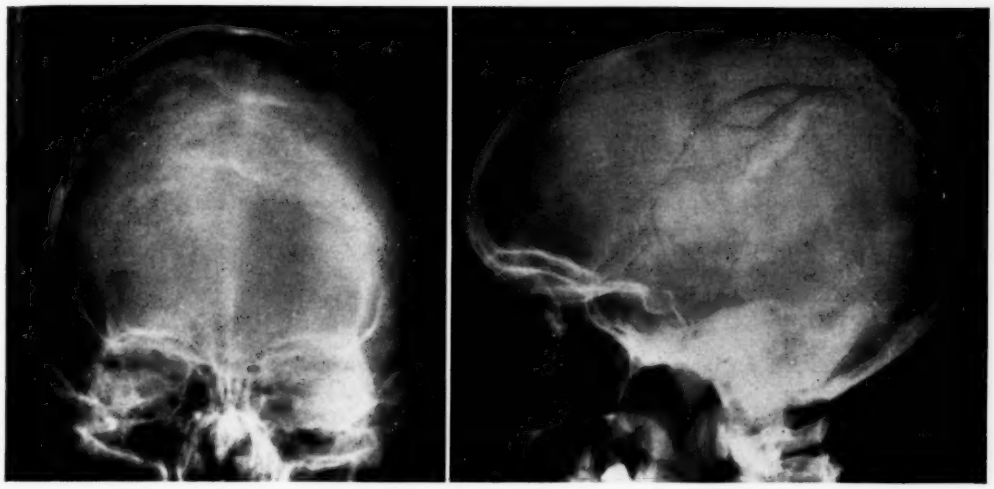


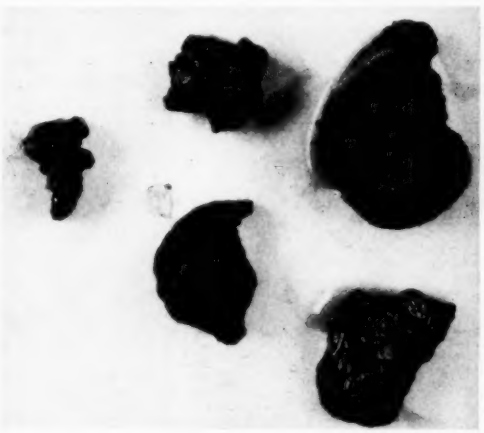
Fig. 3. b, c. Bilateral extradural hemorrhage. There was subdural hemorrhage and massive clots in the temporosphenoidal lobes in this case. (Rules show centimeters.)



a b

twelve hours was described by Jacobson (49). A right middle meningeal hemorrhage with fracture was found at post-mortem examination. The rarity of extradural hemorrhage in infancy is explained on the basis of a greater degree of adherence of dura to the bone as well as the lack of vascular depressions in the bone in the form of meningeal grooves or canals. After the age of ten, the condition occurs more frequently, and it is most typically seen in adult life.

Extradural hemorrhage most commonly occurs after falls and direct blows to the head. Middle meningeal hemorrhage has been reported after injuries sustained with poker, spade, and brick bat (Jacobson, 49). Fighting may be a cause. Gunshot wounds have been known to produce it (Guthrie, 41, Gross, 33, and others). Liddell (63) described a case caused by a blow from a shell fragment. In Jacobson's series, several cases were described in which the etiological factors were musket wounds. In recent years, bicycle accidents are found to produce a higher incidence of middle meningeal hemorrhage than other types of injury (Gross and Ehrlich, 34). Auto accidents may result in this type of lesion. Simple and compound depressed fractures may be associated with middle meningeal hemorrhage (Fig. 4, a, b, and c).



c

Fig. 4. a, b, c. Compound depressed skull fracture of the right posterior parietal region with a large extradural hematoma.

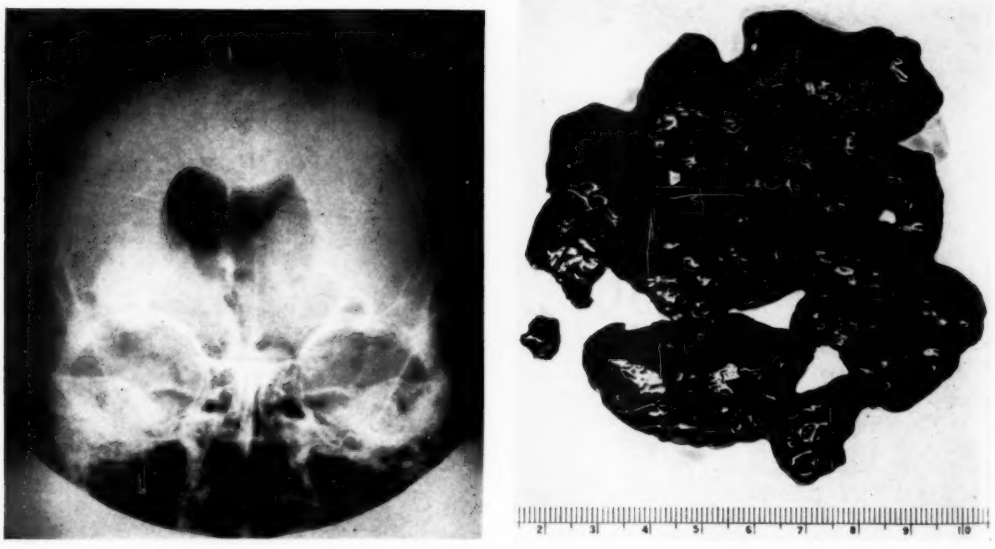
State of consciousness. In middle meningeal hemorrhage, varying changes of the state of consciousness occur: (1) there may be an initial short period of unconsciousness followed by a lucid interval before the secondary unconsciousness supervenes; (2) there may be no initial period of unconsciousness due to the blow, but unconsciousness may occur several minutes, hours, or days later; (3) there may be no unconsciousness at any time, but the patient may have subjective symptoms, particularly headaches; (4) there may be alternating periods of disorientation, semiconsciousness, or a fairly normal conscious state over a period of days; (5) the patient may be unconscious from the beginning with an increasing degree of coma; and (6) acute alcoholism may abolish a lucid interval. Thus, it is apparent that

a lucid interval does not obtain in every instance, but when present it may be of significance in the diagnosis of massive intracranial bleeding (Hutchinson, 48). A lucid interval is not pathognomonic of middle meningeal hemorrhage (Peet, 79). The length of the lucid interval, according to Wiesmann (103), varies between fifteen minutes and eleven days. The longest periods of lucid intervals are recorded by Moody (73) as thirty days and by Gurdjian (40) as thirty-one days. In Jacobson's series (49), 32 of 63 cases had a definite lucid interval. In the series described by Kennedy and Wortis (54), 15 of 17 patients had lucid intervals. McKenzie (72) described 20 cases in which only 1 patient was unconscious throughout. Jacobson very aptly stated that the lucid interval may be considered absent, because, first, "it was so short that it was missed"; second, because of acute alcoholism; third, because of brain damage.

At the present time, because of greater likelihood of associated intracranial damage in injuries due to auto accidents, the lucid interval may not be seen as often as before the period of fast transportation. An already unconscious state becoming deeper is a frequent and characteristic change. In 1 case in our series, there was a short period of unconsciousness following the accident and a normal state of consciousness thereafter. Beginning a week after the accident, the patient began to complain of headaches. There was a left choked disc with the suggestion of a lower facial weakness and a Babinski sign on the right side. A 67 gm. extradural hemorrhage of middle meningeal origin was removed on the thirteenth day (Fig. 5, a and b). In this case, there was an associated subdural hemorrhage. In another instance, disorientation alternating with periods of unconsciousness was present for four weeks. The patient developed weakness of the right half of the body which was caused by an extradural clot; this was removed on the thirty-first day.

The changes in the state of consciousness in our series of 30 cases, may be analyzed as follows: 10 had a lucid interval, 12 were unconscious throughout, in 1 there was a short period of unconsciousness after the trauma followed by a normal conscious state, and in 7 drowsiness and disorientation were seen throughout the entire period before operation.

In summary, it may be stated that changes in the state of consciousness are important in the diagnosis of middle meningeal hemorrhage. A lucid interval may be present, but more frequently an already unconscious state becomes deeper. A patient may be conscious for several days with a large extradural hemorrhage.



a b

Fig. 5. a, b. Encephalogram showing a shift of the ventricles to the right caused by the large extradural hematoma in the left parieto-occipital region (b).

Ocular manifestations. Hutchinson (48) emphasized the presence of a dilated pupil on the side of an extradural hemorrhage. He attributed the dilatation to partial involvement of the third cranial nerve by pressure of the clot against the nerve at the superior orbital fissure. Woodhall, Devine, and Hart (106) and McKenzie (72) suggested the possibility of uncinate herniation through the incisura which catches the third nerve in its intracranial course. The possibility that intracranial pressure changes cause the third nerve to become compressed between the superior cerebellar and the posterior cerebral arteries as it passes between them was suggested by Cushing (18) in a consideration of other massive lesions in the cranial cavity. A dilated pupil on the side of the lesion has been repeatedly emphasized as a sign of importance (Grant, 32, Gubler, 35, Hoessley, 45, Holman and Scott, 46, Wiesmann, 102, 103 and others). In our own series, 23 of 30 cases showed a dilated pupil on the side of the lesion (Fig. 6). A constricted pupil on the same side as the hemorrhage is noted occasionally. This was true in 1 case in our series, but Kennedy and Wortis (54) describe it in 4 of a group of 17 cases. In a certain number of patients the pupils are equal in size. There were 6 instances in our group. When the pupils are equal in size, the lesion may be parieto-occipital in distribution, while a dilated pupil on the side of the lesion roughly signifies the site to be about the temporal lobe and toward the base (Hutchinson, 48).

Complete third-nerve paralysis complicating middle meningeal hemorrhage is described in the literature (Kroenlein, 58, Wiesmann, 102). Kroenlein also discussed a case of sixth-nerve paralysis associated with a parieto-occipital extradural hematoma. In our material, there have been 4 instances of unilateral complete third-nerve paralysis. The fourth nerve was involved in 1 of the cases with oculomotor dysfunction. The sixth nerve was involved in another. Recovery has obtained in every instance, including the return of the ability of the pupil to react to light. The presence of a third-nerve paralysis on one side with contralateral paralysis of the body due to pressure against the motor centers of the cortex by the clot simulates the midbrain syndrome described by Webber (Gurdjian, 38). That alternating oculomotor paralysis is seen also with middle meningeal hemorrhage should be remembered (Fig. 7, a and b).

Changes in the optic discs may occur in middle meningeal hemorrhage. In our material, there were 2 instances of definite choking of the discs. There were 3 others with questionable papilledema. In a group of 20, McKenzie (72) saw choked discs in 1 and "filled cups" in 6.

Focal signs. Cock (13), Croft (15), Curtis (16), Davis-Colley (21), Deaver (22), Duret (26),

Fig. 6.

Fig. 7a.

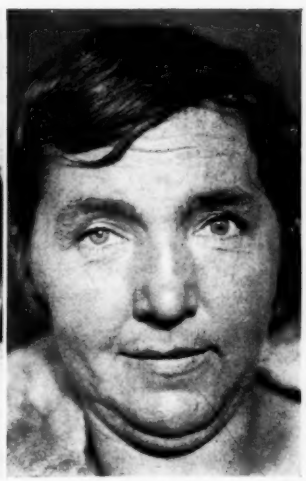


Fig. 7b.

Fig. 6. Third-nerve involvement with dilated pupil due to left middle meningeal hemorrhage.

Fig. 7. a, b. Complete third-nerve paralysis on right side due to middle meningeal hemorrhage on the right side. The left lower face is smoothed out suggestive of weakness. The patient was paralyzed in the left half of the body before operation. Recovery. (Gurdjian. *Arch. Neur. Psychiat.*, Lond., 1932, 28: 29).

Ellis (27), Gaugee (30), Gross (33), Relton, Haslam (84a), Hochheim (44), Jacobson (49), Jopson (53), Kocher (56), Kroenlein (58), Littlewood (64), Longmore (66), Marchant (70), Packard (77), Park (78), Scudder, Lund (87), Short, Dunster (88), Stewart (92), Stroke (93), Wakeley, Lyle (98), Wiesmann (102, 103), and others, have described the typical focal findings in extradural hemorrhage. These are, dilatation of the pupil on the side of the lesion and weakness or paralysis of the opposite half of the body. Focal signs are frequent. In the Jacobson series of 63 cases, complete lack of paralytic or paretic phenomena was seen in only 2 instances. Pyramidal-tract signs, varying between complete hemiplegia and only minor findings such as increased reflexes and extensor plantar reflexes, occurred in the greatest majority of the cases. Among the 30 cases in our series, 26 showed pyramidal-tract signs of a localizing nature. Occasionally, paralysis on the same side as the hematoma may be seen (Woodhall, Devine, and Hart, 106). In the typical case, localizing signs are found several hours after the injury which eventuate in complete hemiplegia, if untreated.

At times, there may be generalized rigidity of the body. This has been described by Jacobson (49) and by Wiesmann (102), and re-emphasized by Jefferson (50). The generalized rigidity is characterized by a state which does not allow flexion or extension of the body parts. It is a condition similar to that seen in decerebrate rigidity but there is little dorsal extension and opisthotonos. In Jefferson's case, there was extensive extradural hemorrhage in the left frontal region.

Bilateral pyramidal-tract signs may occur particularly late in the progress of the disease. They may be brought about by increased intracranial pressure. In a unilateral lesion, the pressure on the affected side may cause paralysis of the opposite half of the body, and if the pressure is sufficiently severe there may be implication of the cortex on the opposite side, which causes bilateral signs (Jacobson, 49). Pressure from the extradural hemorrhage, after involving the cortex on the same side, may displace the brain stem toward the opposite side against the tentorium and cause pyramidal dysfunction on one side because of involvement of the cortex and on the other side because of involvement of the pyramidal tract in the brain stem. Multiple foci of brain damage are a frequent cause of bilateral signs. Of course, bilateral middle meningeal hemorrhage may cause bilateral signs.

Occasionally, there may be no localizing signs, particularly no pyramidal-tract signs. Jacobson described 2 examples. Four cases in our series belonged in this group. In 2 patients, the clot was in the frontal region and in the other 2, it was found in the posterior parietal and occipital regions. The presence of the clot over silent portions of the cortex best explains the absent findings. A sufficiently slow seepage may allow the intracranial structures to accommodate the enlarging mass, without local dysfunction or localizing signs.

Mention has already been made concerning the syndrome of third-nerve paralysis on the side of the hemorrhage with paralysis of the opposite half of the body. This was present in 4 cases in the authors' series. The presence of alternating oculomotor paralysis may suggest middle meningeal hemorrhage rather than a midbrain lesion, in craniocerebral injury.

Convulsions do not occur very frequently, but have been repeatedly described (Goode, 31, Relton, Haslam, 84a, Kroenlein, 58, Scudder, Lund, 87, Stewart, 92, Wakeley, Lyle, 98, Wiesmann, 103, and others). Actually, whether these are caused by localized pressure of the hematoma, general increased intracranial pressure, or from associated cerebral contusions is difficult to ascertain. Usually, generalized convulsions are the rule. In the authors' series 5 patients had generalized convulsions and 1 had jacksonian seizures. Kennedy and Wortis (54) described 5 cases with convulsions, 2 being jacksonian in type, in a total of 17 patients.

Sensory changes have been described and they are said to have occurred in 7 of 225 cases collected by Wiesmann (102). There was unilateral impairment of sensation in this group. Aphasia is a common finding with left-sided lesions. It may not be recognized until after operative removal of the clot. Catatonia was noted in 1 case in our series (Gurdjian, 37). The patient had aphasia also. The hematoma was found in the left temporoparietal region. Wiesmann (103) also described automatic movements, such as lying with the face toward the side of the lesion in 3 cases. The eyes may point toward the lesion (conjugate deviation) particularly early in these cases (Stewart, 92).

Appearance of the scalp. Before the days of roentgen diagnoses, the physician tried to diagnose middle meningeal hemorrhage by the appearance of the scalp and by whether or not a fracture line or depression could be felt by palpation. A "puffy" swelling of the scalp in the temporoparietal region, a dilated pupil on the same side, and paralysis of the opposite half of the body were considered suggestive of extradural hemorrhage.

The "puffy" swelling on the side of the fracture may be caused by leakage of the clot from within the cranial cavity into the extracranial tissues. Compound fracture of the skull and penetrating wounds due to bullet, knife, shell fragments, if associated with some of the mentioned signs of compression, were considered cases of extradural hemorrhage.

Roentgen findings. Roentgen examination of the skull is useful and should precede operative intervention. If patients are well enough to be operated on, they are well enough to have studies made of the skull. Fracture is almost always present in cases of middle meningeal hemorrhage. The fracture line usually crosses the middle meningeal groove or grooves (Fig. 8). There may be depression. In our series, there was a fracture in every case and depression was present in 6 instances. Extradural hemorrhage may be associated with a simple depression which may or may not be at a site of choice from the standpoint of operative intervention for middle meningeal hemorrhage. Hence, preliminary roentgen study may be very helpful. In fact, in a simple depression, the progressive appearance of paralytic phenomena should make one suspicious of extradural hemorrhage. Extradural hemorrhage is so consistently in close association with a fracture that it seems advisable in some cases to look for it along the course of the fracture line, provided of course, other signs suggest such a diagnosis.

Pulse, respiration, temperature, and blood pressure. In the early cases, the pulse may be slow, full, and bounding in character. All of the older writers have emphasized the "pressure pulse" in extradural hemorrhage (Jacobson, 49, Kroenlein, 58, Marchant, 71, and Wiesmann, 102, 103). A pulse rate from 40 to 55 is seen characteristically early in the course of the disease, but in untreated cases the rate increases until the pulse becomes very rapid and thready.

Respirations. Respirations have been reported as being of deep, snoring, stertorous and, in some cases, Cheyne-Stokes quality. Later, the respirations may become hyperpneic associated with a rapid pulse and pulmonary edema.

Temperature. The temperature in the uncomplicated case of middle meningeal hemorrhage is usually slightly elevated, but it may increase to high levels in the untreated case. As a rule, temperatures from 99 to 101 degrees are obtained early in the progress of the disease.

Blood pressure. The blood-pressure determinations have been of little value in establishing oncoming increased intracranial pressure due to middle meningeal hemorrhage. Possibly this is because the pressure in the cranial cavity is never as high as the systolic blood pressure (Browder and Meyers, 8). However, occasionally the blood pressure may rise and be accompanied with other signs of compression (Cushing, 17).

Fig. 8. Fracture line in a case of right middle meningeal hemorrhage.

Spinal-fluid findings. There may be bleeding into the subdural as well as the extradural region from a tear in the dura. Frequently, there is associated subarachnoid hemorrhage so that the spinal fluid is bloody. A bloody spinal fluid does not rule out extradural hemorrhage. Kennedy and Wortis (54) noted bloody spinal fluid in 11 of 15 cases. McKenzie (72) observed bloody fluid in 4 of 6 cases. In our series, there was bloody spinal fluid in all 14 cases punctured. The spinal-fluid pressure is usually high. The highest pressure in our series was 650 mm. of water. In 1 case, it was only 45 mm. of water after a previous puncture the day before had shown a pressure of 135 mm. McKenzie noted a pressure of 75 mm. in 1 case; the highest pressure observed was 300 mm. It should be emphasized that a normal or subnormal cerebrospinal-fluid pressure does not rule out an extensive extradural clot. In such cases, one should be guided by the general status of the patient and if there are evidences of increasing severity of symptoms and signs, operative intervention may be desirable.

Summary of signs and symptoms. On review of the various features of extradural hemorrhage of middle meningeal distribution, it is evident that a combination of symptoms and signs may point to a possible space-occupying mass. Any individual feature may be insignificant if taken by itself, but if considered in conjunction with other features an exact diagnosis may be concluded. However, it

must be emphasized that there are many bizarre and atypical cases which are difficult to analyze. Particularly in the present day type of injuries, due to fast transportation, associated damage to other portions of the intracranial structures is frequent and confuses the picture. In some cases, extradural hemorrhage may simulate the clinical picture of subdural hemorrhage and subdural accumulation of spinal fluid. Contusions and bruises of the brain with localized swelling may mimic extradural hemorrhage. In the questionable case, a diagnosis of massive intracranial lesion should be made, to be confirmed by exploration.

Treatment. The treatment of choice is operative removal of the clot. The earlier investigators spent much time and energy in the operative approach in these cases. Exact localization of the various branches of the middle meningeal artery by means of the trephine was worked out. The methods of Kroenlein (58), Plummer (81), Poirier (82), Steiner (91), Vogt (97), Witherle (105), and others, to reach the anterior and posterior divisions of the middle meningeal artery by trephine, have been described with meticulous care. However, as stated by Cushing (19), in 1912, such exact localization is not necessary to uncover the usual collection from a middle meningeal hemorrhage. Cushing advised his well known subtemporal decompression, which is still a method of choice with most present-day authors (Gurdjian, 40, McKenzie, 72, Verbrugghen, 96, and others). A low osteoplastic flap is suggested by Krause (57).

The clot may be removed by suction or in large pieces. The bleeding points on the dural surface can be stopped by electrocautery, suture, silver clips, or by transfixion of the dura to the pericranial tissue. A lacerated middle meningeal artery is seen infrequently, the bleeding point having become thrombosed before operation. After the clot is removed and the bleeding stopped, the epidural space may be loosely packed with gauze. The gauze drain is taken out in from twelve to eighteen hours.

Tying of the common carotid and external carotid arteries was practiced by Liddell (63), Ransohoff (84), and others, in the latter part of the last century. Jacobson (49) advised against such ligations but he stated that the external carotid artery should be used if ligation is decided upon. Thorman (94) is quoted as having done the first extracranial middle-meningeal ligation in 1828 (Wiesmann, 103). In 1936, Verbrugghen (96) described a case in which external carotid ligation was necessary to stop the extradural bleeding.

It is important that roentgen study of the skull be made before the operation. A depression or a fracture line may be of help in the determination of the site for trepanation. If a middle meningeal hemorrhage is suspected, two trephine openings should be made, one a little in front and above the ear, and the other just behind and above the ear. If these are negative, the signs and symptoms of the case will indicate whether the other side should or should not be opened. We prefer to make use of encephalography following a negative trepanation in selected cases. This is more advisable than making many openings in the skull in the hope that an extradural clot may be discovered. Following the pneumographic studies, appropriate treatment may be undertaken immediately. If a clot is found close to the base, a large subtemporal decompression is the operation of choice. If the clot is beyond the confines of the temporal muscle and fascia, a small bone flap may be more advantageous.

The prognosis in middle meningeal hemorrhage is good. In the case of pure middle meningeal hemorrhage, timely operative intervention should give excellent results. Associated lesions elsewhere in the cranial cavity are frequent but even among this group of cases, the removal of a large extradural clot may result in recovery. There were 22 recoveries in the 30 operated cases. The post-traumatic sequelae are not as severe and as serious as in other classes of head injury. In the 14 cases followed from one to ten years, there was no history of epilepsy, and complaints referable to the head were minimal except in 1 case.

EXTRADURAL HEMORRHAGE OF DURAL-SINUS ORIGIN

Extradural hemorrhage of dural-sinus origin is rare. Although dural sinuses may be injured or torn, the resultant hemorrhage seldom collects between the dura and skull. More frequently there may be intradural hemorrhage. The symptoms and signs of extradural hematoma of dural-sinus origin are not definite because, first, the hemorrhage may collect in various portions of the cranial cavity and so the location of the hematoma is not consistently the same, and, second, because of frequent associated lesions involving the other portions of the intracranial contents. However, certain pertinent conclusions may be drawn concerning the recognition and management of such cases. The material will be discussed under the headings of anatomy and pathology, etiology, symptomatology, and treatment.

Anatomopathology. The dural sinuses are endothelial-lined blood spaces situated between the

periosteal and meningeal layers of the dura. Through these channels, blood is conveyed from the cerebral veins, and from veins of the meninges and diploe into the general circulation. They communicate with extracranial veins by the emissary veins which run through the foramina in the cranial bones. There are 16 sinuses, 6 median and unpaired, and 10 consisting of 5 lateral pairs. Of particular interest in this study are the superior longitudinal and lateral sinuses, for they are the almost exclusive source of extradural hematomas of sinus origin.

According to Auvray (2, 3), Brown (9), Dechaume-Moncharmont (23), Gau (29), Luys (67, 68), Wharton (101), and others, almost any of the sinuses may be involved. The one most commonly injured is the longitudinal sinus. The lateral sinus is next in frequency. Other sinuses are very rarely injured but examples of hemorrhage from the cavernous sinus, straight sinus, and the circular and parietal petrosal sinuses have been reported. In the series of 57 cases collected by Luys (68), the longitudinal sinus was involved in 41 and the lateral sinus in 16 instances. Among the 70 cases collected by Wharton (101), there were 40 examples of injury to the superior longitudinal sinus, 25 to the lateral sinus; three to the cavernous sinus; 1 to the straight sinus, and 2 to the transverse sinus. The bleeding may be internal into the subdural and subarachnoid regions, or external in an extradural location. It is possible for an intracranial bleeding point from the sinus to discharge through the fissures in the fracture into the scalp tissues and produce a subcutaneous hematoma.

In the consulted literature, there are few examples of extradural hematoma due to venous-sinus bleeding. The very low venous pressure (5 to 9 mm. of mercury) is not conducive to hemorrhage between bone and dura except under the most favorable conditions even though the vessels may be badly torn. Luys (68) stated that in the anterior half of the vertex, the dura and the superior sagittal sinus are less adherent to bone than more posteriorly. According to this author, an extradural hematoma would result from laceration of the anterior portion of the sinus, whereas, subdural hemorrhage is more apt to obtain with injury to the channels more posteriorly. Luys described an extensive extradural hematoma involving both hemispheres in the frontoparietal region. The dural covering of the lateral sinus is easily separated from bone but this sinus, because of its location, is well protected from injury in the absence of perforation by fragments of bone or other types of penetrating wounds. A frequent form of injury to the superior longitudinal and lateral sinuses is perforation by depressed fragments of bone. Because of the low venous pressure, there may be no bleeding from the sinus except when the fragments of bone are removed at operation. There are many examples in the literature of fatal hemorrhage from lacerated superior longitudinal or lateral sinuses during operative removal of depressed fragments and foreign bodies.

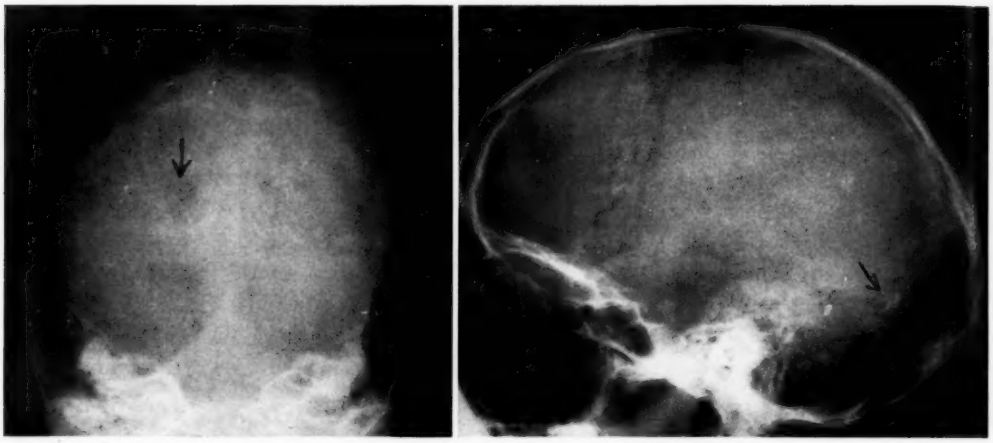
Air embolism may complicate extensive tears of the venous sinuses during repair. The question of air embolism is discussed by von Bergmann (103), Doench (24), and others. The latter described a case in which death followed immediately after air entered, when the torn sinus was exposed for a moment. The peculiar "suction noise" preceded the patient's last gasp.

Etiology. Lacerations and tears of the venous sinuses are most commonly seen with depressed fractures from all causes. The vessels are lacerated by the sharp edges of the depressed fragments. Penetrating wounds due to bullet, stab, saber, and shell fragments may also be associated with sinus injuries (Drossert, 25, Guthrie, 41, Liddell, 62, Mantelli, 69, and Nancrede, 76).

Luys (67) discussed a case of rupture of the lateral sinus without fracture. A blow from above the head may momentarily deform the skull, causing a side-to-side expansion with pulling and tearing of the lateral sinus. Most cases of sinus injury without fracture are described as occurring at the junction of sinuses with their tributary veins, with consequent subdural hemorrhage.

Lateral and longitudinal sinus injuries have been described at birth. Litzmann (65) noted a ruptured superior longitudinal sinus due to overriding of the parietal bones with eventual tearing of the vessel. A forceps delivery with skull compression and distortion may eventuate in tear of the longitudinal sinus. Luys (68) mentioned the possibility of dural-sinus tears due to birth injury. Munro (74) described 2 cases of extradural hemorrhage due to rupture of the lateral sinus at birth. One of these patients died thirty-seven hours after birth. There was an extensive dural tear in the posterior fossa with massive hemorrhage from the lateral sinus. No localizing or characteristic signs were noted.

Symptomatology. Injury to the dural sinuses usually is not associated with an extradural clot of surgical proportions. Anatomically, the superior longitudinal and the lateral sinuses are the only ones giving rise to an extradural mass. Injury to the rest of the dural venous channels practically always results in intradural bleeding.



a b

c

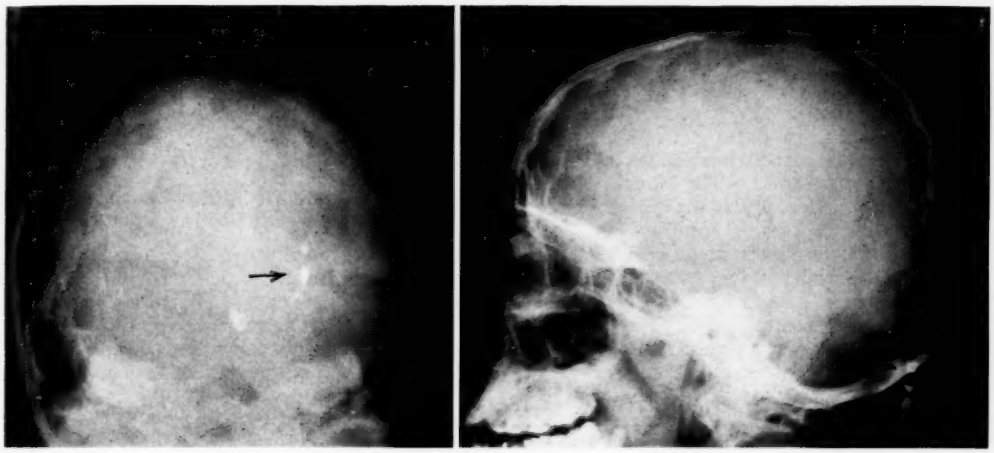
Fig. 9. a, b, c. Perforating wound of the lateral sinus with extradural hematoma over the cerebellum and occipital lobes. Operative removal and recovery.

Extradural hematoma of superior longitudinal-sinus origin may simulate middle meningeal hemorrhage. There may be a lucid interval and with the escape of blood laterally, the motor centers may be compressed and contralateral paralysis ensue. Wharton (101) described a case of sagittal-sinus extradural hematoma which extended over the right hemisphere. The patient had a lucid interval and, with increasing drowsiness, developed a paralysis of the left half of the body. Middle meningeal hemorrhage was diagnosed but in the absence of a hematoma in the right temporal region, Wharton followed the fracture line upward by extending his incision and near the midline he uncovered a 4 oz. clot. There is said to have been marked bleeding from the sagittal sinus. This was packed and eventually the patient made a good recovery.

The syndrome of the superior longitudinal sinus (Holmes and Sargent, 47, Levi-Valensi and Ezes, 61, Willensky, 104) was seen in 1 of our cases (Gurdjian, 39). There was marked rigidity of both lower limbs and the left upper limb with bilateral pyramidal-tract signs. At the post-mortem examination, a perforating wound (ice-pick injury) of the superior longitudinal sinus was found to have caused extensive extradural and intradural hemorrhage compressing the inter-hemispheric region at the motor cortex. The intradural portion of the clot was between the two hemispheres.

Extradural hemorrhage of lateral-sinus origin has been described in many papers. The clinical picture is almost never pure because of associated brain damage. A large hematoma in the posterior fossa from a tear of the lateral sinus was described by McKenzie (72). It was not diagnosed before death but there was marked hypotonia of all limbs suggestive of cerebellar dysfunction.

Coleman and Thomson (14) described a case of extradural hemorrhage in the posterior fossa. The patient struck the back of his head because of a fall from a moving truck and this caused a hematoma in the occipital region. There was no unconsciousness and no abnormal neurological



a b

Fig. 10. a, b. Bullet wound of the lateral sinus with profuse bleeding which was repaired with a muscle transplant. Recovery. (Gurdjian. *South. Surgeon*, 1941, 10: 7.)

findings so the patient was sent home. Twenty-four hours later he returned because of headaches, drowsiness, and vomiting. The neurological examination was again normal and the patient was again sent home. The following night he returned in a moderately drowsy state, complaining of headaches. He was admitted to the hospital and in the course of another twelve hours was noted to have a nuchal rigidity, generalized hypotonia, and areflexia. There was no Babinski sign. The Wassermann test was positive. Roentgen study showed a midline occipital fracture extending into the foramen magnum. The patient slept on his right side and when his position was changed, he would invariably move to his right side. At operation, a large hematoma was found in the posterior fossa, mostly to the right of the midline. The bleeding was thought to come from the torcular herophili. There was complete recovery of reflexes and muscle tone before discharge from the hospital.

On the basis of this case, Coleman and Thomson (14) suggested a syndrome of posterior fossa extradural hemorrhage. Several days may elapse before signs of compression become evident because bleeding from a venous sinus is under very low pressure. There may be hypotonia; tendon reflexes may become abolished; there may or may not be nystagmus. They suggested that the reason the patient lay on the affected side was to keep the pressure off the vestibular and vagal centers. An epidural hematoma of about 2 oz., removed in a case of perforation of the lateral sinus to the left of the midline, is shown in Figure 9, a, b, and c. The patient was in a bent position and upon straightening up, the head struck an iron bar of ¼ in. diameter. The iron bar perforated the skull. There was no unconsciousness but over a period of thirty-six hours, the patient became stuporous. An extensive hematoma was removed from the epidural space and a small tear in the sinus was closed with a piece of muscle. In this case there was a rigid neck and slightly bloody spinal fluid with a pressure of 280 mm. of water. The reflexes were active throughout.

The most common form of dural-sinus injury is not associated with extradural hematoma. A tear of the sinus is frequently caused by depressed fragments of bone. In many cases all is well until elevation of the depressed fracture is attempted, then hemorrhage may occur. Carlucci (10) described a case in which a midline depression was associated with a progressive weakness of the right upper limb. Because of the complication, it was thought advisable to elevate the depression. On removal of one of the fragments of bone, there was severe bleeding because of a lacerated sagittal sinus. The wound was packed. The following day the patient was spastic in both lower limbs. After the pack was removed, the spasticity of the lower extremity disappeared.

Perforating wounds such as those caused by bullets, stabs, and sharp utensils may result in lacerations of a sinus. Figure 10 a and b is an example of perforation of the lateral sinus by a bullet. Because of the excessive bleeding, the

child was operated on four hours after the injury. After débridement of the wound, the opening in the skull was exposed and upon removal of the splinters of bone and the bullet fragments there was a gush of blood. The sinus tear was packed with gauze and a few days later it was repaired with a piece of muscle obtained from the leg. Recovery was uneventful. The lateral-sinus tear may discharge through a fissure in the petrous bone extending into the external auditory canal with bleeding from this orifice (Luys, 68).

Treatment. In the management of dural-sinus injury, two classes of lesions may be encountered. First, those with intracranial bleeding and eventual signs of compression and, second, those in which a torn sinus either bleeds externally or is kept from bleeding because of pressure of the surrounding tissues, depressed fragments, and foreign matter, and also because of the low venous pressure. In this article, we are primarily interested in extradural hemorrhage of dural-sinus origin. This rare complication, when present, can be treated in the same manner as any other extradural hemorrhage. Roentgenograms of the skull may help locate a depression or fracture line. If such a lesion is suspected, preferably no lumbar puncture should be done in order not to confuse the clinical picture or cause herniation of the cerebellum through the foramen magnum (Coleman and Thomson, 14). After removal of the clot, the bleeding should be stopped by electrocautery, gauze packing, or the use of a muscle graft. Small, discreet tears in a sinus may be repaired by suture in selected cases. The presence of a subdural hemorrhage should be kept in mind and in some cases it may be necessary to open the dura to evacuate a subdural clot.

Dural-sinus tear without epidural or subdural hemorrhage may be seen with depressed fractures of the vertex, and occipital region and with perforating wounds. In such cases, if a débridement is deemed advisable, the possibility of a torn venous sinus, which is for the time being compressed by depressed pieces of bone or foreign matter, should be kept in mind. With the release of the pressure by débridement and removal of the fragments, the lacerated sinus bleeds profusely. A previously obtained large piece of muscle may be valuable on exposure of an extensive laceration. Small tears in the sinus may be sutured. The electrocautery had better not be used with injuries of the superior longitudinal and lateral sinuses. During the operative procedure, it is best to keep some pressure on the sinus at all times in order to avoid air embolism, which may be fatal.

The prognosis in dural-sinus tear is serious. In Wharton's (101) series there was a mortality of 64 per cent. Auvray (3) analyzed 163 cases with a total mortality of 41 per cent. There were 51 nonoperated cases with a mortality of 82 per cent and 112 operated cases with a mortality of 21 per cent.

EXTRADURAL HEMORRHAGE FROM DIPLOE AND EMISSARY VEINS

The veins of the diploe located in the cancellous tissue between the internal and external tables of the skull are thin walled, irregular channels of varying size. They terminate as four or five main branches either externally into extracranial veins or internally into the venous sinuses, as emissary veins. There are usually four such veins which open into the sagittal sinus and two which open into the transverse sinus, the latter being the mastoid emissary and the postcondyloid veins.

Massive hemorrhage from diploic and emissary veins is practically never seen and the literature reviewed contains no examples of extradural hematoma of a size sufficient to cause compression solely from injury to these venous channels. The authors have seen 2 examples of a fairly large extradural hematoma associated with a depressed fracture posterior and slightly superior to the mastoid region and involving the occipital emissary vein. In neither case were there signs of compression. Small, nonsurgical, extradural clots are frequently seen with depressed fracture as a result of diploic vessel bleeding.

SUMMARY AND CONCLUSIONS

The most common form of extradural hemorrhage is of middle meningeal origin. In the typical case there may be a lucid interval with increasing stupor and the eventual appearance of localizing signs. More often the patient is unconscious throughout, but with the increase in the size of the clot the state of unconsciousness deepens.

Middle meningeal hemorrhage is almost always associated with a fracture. The hemorrhage is usually adjacent to the fracture. It is reasonable to look for a middle meningeal hemorrhage in the vicinity of a fracture. Simple and compound depressed fractures may be associated with middle meningeal hemorrhage. One should suspect extradural hemorrhage in cases of simple depressions associated with signs of increasing compression.

The presence of blood in the spinal fluid does not rule out middle meningeal hemorrhage. In most cases the spinal fluid is bloody because of associated subarachnoid hemorrhage. The fluid pressure is usually high but may be low at times.

In most cases a subtemporal decompression is ample for removal of a middle meningeal clot. Occasionally, the clot is in a parieto-occipital position and extends toward the midline. In this type of case a small bone flap may be turned.

Extradural hemorrhage of dural-sinus origin is rare. If there is bleeding, it usually collects under the dura. Extradural hematoma of sinus origin almost always is from the superior longitudinal and the lateral venous sinuses. Frequently, associated damage to other portions of the intracranial structures may confuse the clinical picture, but extradural hematoma of superior sagittal-sinus origin may give rise to a syndrome similar to that of middle meningeal hemorrhage. There may be a lucid interval followed by increasing stupor and eventually implication of the motor cortex on one or the other side due to a lateral extension of the clot. In other cases a syndrome of the superior longitudinal sinus may obtain which is characterized by bilateral pyramidal-tract signs with spasticity of both lower limbs and one or both upper limbs.

Extradural clot of the posterior fossa is frequently associated with other lesions of the intracranial structures but it may occur in a pure form. The clinical picture may then be characterized by increasing stupor and eventual hypotonia and areflexia.

The sinuses may be lacerated but no bleeding may occur because of pressure by depressed fragments of bone and soft tissue or foreign matter. In penetrating wounds and in depressions over the superior longitudinal and lateral sinuses, the possibility of a torn sinus should be kept in mind. If débridement is attempted, one should be prepared for any eventuality. In the presence of a torn sinus, the tear, if small, may be repaired by suture. If there is a large laceration, it may be necessary to pack with gauze or, better still, with a muscle graft.

SYNOPSIS OF 30 CASES OF MIDDLE MENINGEAL HEMORRHAGE

State of consciousness	
Lucid interval	10
Unconscious throughout	12
Drowsy and disoriented	7
Short unconsciousness followed by normal conscious state	1
Pupils	
Larger on same side	23
Larger on opposite side	1
Equal	6
Extraocular palsy	
Third	4
Fourth	1
Sixth	1
Focal signs	
Present	26
Not present	4
Vital functions	
Pulse	45–60
Respirations	18–26
Temperature	100–102
Spinal-fluid findings	
Pressure	45–650
Bloody	in all 14 cases punctured.
Associated massive lesions	
Subdural hemorrhage	7
Temporosphenoidal-lobe clot	3
Subdural accumulation of spinal fluid	2
Results	
Recovered	22
Died	8

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

King, J. E. J.: Oxycephaly. *Ann. Surg.*, 1942, 115: 488.

Oxycephaly, scaphocephaly, or premature craniostosis is a relatively rare disease. It leads to a malformation of the skull which is rather peculiar and typical. The skull is usually pointed like a tower, or sway-backed. The underlying cause is that the suture lines close tightly and are obliterated before the anterior fontanelle closes. This process exerts a marked pressure on the expanding brain, and, if not relieved, may cause death.

In 1936 the author was confronted with this problem in a particular case, and not being able to find an adequate operative procedure he devised one. Four cases were treated by this method, the first in November, 1936.

The characteristic syndrome of these cases, apart from the appearance of the skull, consists of (1) headache at an early age, (2) irritability and mental dullness, (3) deep convolutional markings and thinning of the skull with undistinguishable suture lines, (4) thinning of the dura, (5) the unusual contour of the skull, (6) markedly increased intracranial pressure with small ventricles, as measured by ventriculography, (7) bilateral papilledema followed by atrophy and failing vision, (8) marked bilateral exophthalmos, and (9) generalized convulsions. The condition must be distinguished from microcephaly and mongolian idiocy.

The operative procedure is as follows:

With the head suitably prepared and the patient in the prone position, a midline sagittal incision is made from the hairline anteriorly almost to the external occipital protuberance posteriorly. The scalp and pericranium are reflected laterally to the superior curved lines. Geometrically placed burr holes are made, from 1½ to 2 in. apart, over the exposed area of bone. These burr holes are then joined together by means of a DeVilbiss bone forceps, with the result that, approximately, squares of bone are fashioned over the exposed surface of the skull.

Two pieces of technical advice are given: (1) the squares of bone should connect with one another by a small intact isthmus which is left until the close of the procedure, otherwise they may become unmanageable and fall to the floor; and (2) the dura should not be opened. The use of bone wax is not advised.

Four cases have been treated in this way, and the results have been good. The illustrations which accompany the article show a striking improvement in the appearance of the patients. Convulsions ceased, the exophthalmos declined, the choked discs receded, and the psychometric examination showed improvement. The hypopituitarism associated with this condition was improved. Ample illustrations and descriptions are provided.

ADRIEN VERBRUGGHEN, M.D.

Coleman, C. C.: The Treatment of Compound Fractures of the Skull. *Ann. Surg.*, 1942, 115: 507.

From his study of 2,000 consecutive head-injury cases the author believes that early operation should be done to prevent infection in compound fractures of the cranial vault. The judiciousness of delaying operation for from twenty-four to forty-eight hours is open to question. In this series there were 224 compound fractures of the skull with a gross mortality rate of 16.5 per cent. Operation for depressed or contaminated linear fracture was performed on 105 patients with a mortality rate of 11.4 per cent. It is rarely necessary to delay operation more than eight hours, since shock is not usually present. Clinical observations and blood-pressure readings in a large series of head injuries show the incidence of shock to be less than 10 per cent. When injury is confined to the head, shock is even more unusual. The author found no instance of shock developing from early operation for compound fracture of the skull. In the event that delay is unavoidable because of shock or associated injuries, early chemotherapy followed by operation can have a successful outcome, but this does not invalidate the arguments for early operation in the majority of patients, who are in good general condition.

The operative procedure varies from disinfection, débridement, and suture of the scalp laceration overlying a compound linear fracture, to an extensive procedure requiring thorough débridement of scalp, bone, dura, and brain, but the surgical principles are the same in all open wounds of the head. Novocaine infiltration is used whenever practicable, and morphine is given without hesitation to quiet a restless patient at the time of operation if there is no indication of increased intracranial pressure. The scalp laceration is freely irrigated with Ringer's or saline solution, and the wound margins are débrided back from the edge for at least ⅛ in. Irrigation is repeated and the fracture line is examined. If there is no depression or contamination of the fracture line, the wound is closed. If hair or grit lies in the line of fracture, the contaminated area is excised with a narrow rongeur. If depressed fragments are locked, an adjacent bur-opening and the rongeuring away of a small area of bone may be necessary.

Caution is necessary in removing bone fragments from the vicinity of a large venous sinus. If sinus hemorrhage occurs it is best dealt with by the application of muscle grafts. The dura is not opened unless there is evidence of considerable subdural bleeding, especially in the late case in which there may be doubt concerning the complete disinfection of the wound. Bone fragments are discarded if one is not reasonably sure that they are free of contamination, or if operation has been delayed beyond twelve hours, or, as a rule, in the presence of a torn dura with severe brain injury. The suction apparatus with 8 or 10 lb. of pressure or a bulb syringe is used to remove macerated brain tissue, debris, and blood clot down to healthy brain tissue. Hemorrhage in the depths of a laceration can be controlled by drawing the bleeding vessels into the suction tip and applying electrocoagulation. Following thorough irrigation and suction the wound is filled with Ringer's solution and the dura is closed in all cases. A graft of pericranium, galea, temporal fascia, or even fascia lata may be employed to secure tight closure. Drainage material is not used.

Fracture of the frontal sinus with laceration of the adjacent dura is treated first by disinfecting the scalp and brain wounds and then by tightly closing the dura, with a graft if necessary. Detached bone fragments and the sinus mucous membrane are removed, and the sinus is packed with iodoform gauze. Sulfanilamide is started promptly, but is not used locally within the dura. Under the assumption that the brain wound has been thoroughly disinfected, the most important step in these cases is tight closure of the dura without drainage.

The indications for cranioplasty in large cranial defects are the cosmetic effect and the relief of certain subjective symptoms and of fear of injury to the unprotected area. For this purpose perforated celluloid plates are simpler and more satisfactory than autogenous grafts from the outer table or from the ribs. A cranial defect should not be repaired until several months after complete healing of the wound. Increased intracranial pressure and retained foreign bodies are contraindications to cranioplasty.

JOHN L. LINDQUIST, M.D.

Dill, J. L.: Osteomyelitis of the Frontal Bone. *Laryngoscope*, 1942, 52: 267.

Dill states that the occurrence of osteomyelitis in cases of frontal-sinus infection is still a problem. It is a serious complication, and much more so when it occurs postoperatively. Perhaps chemotherapy may decrease the frequency of its occurrence and prove of value, not only in the treatment but also in reducing the incidence. JAMES C. BRASWELL, M.D.

Meng, C. M., and Wu, Y. K.: Tuberculosis of the Flat Bones of the Vault of the Skull. A Study of 40 Cases. *J. Bone & Joint Surg.*, 1942, 24: 341.

A comprehensive review of tuberculosis of the flat bones of the skull is presented, together with experiences gained from 40 cases definitely diagnosed by the authors. In 25 of the cases the diagnosis was established by histological examination, animal inoculation, or culture.

Eighty per cent of the patients were persons under twenty years of age. Males were affected more frequently than females. A history of trauma was only occasionally elicited. Eleven patients had a single associated lesion and 23 patients had multiple lesions including pulmonary, bone and joint, intra-abdominal, lymphatic, and skin involvement. It was found that other flat bones, as the sternum, scapula, and pelvic bones, were more affected than is usually the case. The bovine type of tubercle bacillus was thought by many to be the causative factor, but the authors believe otherwise in these cases. They also believe that skull lesions are always secondary to another focus. The diploe is first attacked by the blood-borne infection and extension occurs to the inner and outer tables.

The pathological types include the circumscribed perforating lesion described by Vollkman. This contains a sequestrum, well formed and corresponding to the shape of the defect. Most of the authors' cases were of this type.

In the diffuse infiltrating type, occurring more commonly in children, the disease involves the compact tables by extension and causes multiple perforations. Only 2 of the authors' series were of this type of lesion. In both, a subperiosteal abscess was formed which broke down to form a draining sinus. The external surface of the dura may be involved with caseous material and thickening but the cerebral surface appears normal. This fact accounts for the infrequency of tuberculous meningitis as a complication.

Clinically the disease is insidious in onset; it was not the cause of the patient's visit to the clinic. It is usually painless, and resembles a cold abscess in its early stages. It may be mistaken for a lipoma or sebaceous cyst. Pulsation of the mass is indicative of perforation of both tables. In 20 patients a draining sinus was present. In several the skull lesions were found only on post-mortem examination. Most of the patients were afebrile and in good nutritional status. In children the tuberculin test was of value and all the children in the authors' series had strongly positive tuberculin tests. Syphilis of the skull must be ruled out, although a positive serology is often seen in these patients. The roentgenogram reveals a predominantly destructive lesion with little attempt at repair. Inoculation of material obtained by aspiration of the abscess or biopsy of the granulation tissue establishes the diagnosis.

Patients seen early and presenting a solitary lesion may be treated by wide excision of the affected bone with primary closure of the scalp.

If there is a discharging sinus or ulcer the wound should be left open. Irradiation therapy was successful in 1 case as the only form of treatment employed and was used in 2 others following surgical excision. The majority of the author's cases were so far advanced that simple local palliative treat-

ment was all that could be accomplished; only 8 of the 40 were suitable for operative care.

DANIEL H. LEVINTHAL, M.D.

EYE

Wong, R. T.: Chemotherapy in the Treatment of Gonorrheal Ophthalmia; Relative Effectiveness of Sulfanilamide, Sulfapyridine, and Sulfathiazole. *Arch. Opth.*, Chic., 1942, 27: 670.

The author has attempted to make a comparative study of the relative merits of sulfanilamide, sulfapyridine, and sulfathiazole in the treatment of gonorrheal ophthalmia. Attention is called to the work of Lawrence who showed experimentally that sulfathiazole has a greater bacteriostatic action against the gonococcus than either sulfanilimide or sulfapyridine, but no previous clinical study has been made on gonorrheal ophthalmia with this drug.

The cases included in this study were only those in which the diagnosis of gonorrheal ophthalmia was confirmed bacteriologically, in most cases by two observers. Daily smears were made in the cases treated with sulfanilamide and sulfapyridine; in those treated with sulfathiazole smears were taken from every four to eight hours until they were negative. The general condition of the patients was observed daily, with laboratory examinations of the drug level in the blood, as well as hemoglobin and white blood-cell determinations. The dose of sulfanilamide and sulfapyridine for infants and children was 0.2 gm. per kgm. of body weight per day, and that of sulfathiazole 0.3 gm. per kgm. of body weight per day. There were only 2 adults in the entire series and they were given 4 gm. of sulfapyridine each day. The drug was given at four-hour intervals, mixed with the feedings in the cases of the infants and children.

The routine adjuvant treatment included frequent irrigations with warm boric-acid solution to keep the eye clear of secretion, and the use of metaphen (1-2500) after each irrigation, atropine in the presence of corneal complications, and foreign protein in 12 cases of the sulfanilamide group only. Only the boric-acid irrigations were used as local treatment in the sulfathiazole group.

A summary of the results is shown in the following table:

Compound	No. of cases	First negative smear	Duration purulent secretion	Time for cure
Sulfanilamide	20	4.9 days	5.7 days	7.2 days
Sulfapyridine	10	2.4 days	3.7 days	4.8 days
Sulfathiazole	10	24.2 hours	2.7 days	3.4 days

In 18 of the cases treated with sulfanilamide, cure was effected within eight days, but 2 cases were refractory. The results with sulfapyridine indicated that it is somewhat more effective; also, cyanosis was less frequent. Sulfathiazole was found to be the most effective drug, however, producing no signs of toxicity, and in no case requiring more than four days for a cure. This seems to be in agreement with the present opinion of urologists as to the relative merits of these drugs in the treatment of gonorrhea of the genital tract. WILLIAM A. MANN, M.D.

Galli-Mainini, C.: Exophthalmometric Measurements in Patients with Thyroid Diseases, with Some Discussion of Their Significance. *Ann. Int. M.*, 1942, 16: 415.

The surface of the human cornea in 50 normal subjects was found to lie in a plane not more than 17½ and not less than 14 mm. anterior to the outer bony rim of the orbit. This measurement was made with an improved exophthalmometer consisting of a pair of transparent plastic rods graduated in millimeters.

With this instrument it was found that patients with nontoxic goiters had normal eye-position measurements. Of 62 patients with hyperthyroidism, 61 had measurements from 18 to 25 mm., i.e., all but 1 were above normal.

In 34 patients with spontaneous myxedema, who had stopped thyroid ingestion for not less than one week, the measurements ranged from 15 to 25 mm. Twenty-one of these had measurements greater than normal. This extraordinary finding suggests a common mechanism in myxedema and post-thyroidectomy exophthalmos. However, 4 patients with myxedema following thyroidectomy for hyperthyroidism who had *not* had exophthalmos preoperatively, had normal eye measurements. In contrast to these, 14 post-thyroidectomy myxedema patients who had had exophthalmos during their preoperative hyperthyroidism, all had measurements above normal.

A discussion of possible mechanisms based on the work of Friedgood, Loeb, Marine, Paulson, and Smelser, concludes the article. PAUL STARR, M.D.

EAR

McGibbon, J. E. G.: Aviation Pressure Deafness. *J. Laryngol. & Otol.*, 1942, 57: 14.

Twenty-six per cent of the total number of aircrew personnel referred to the ear, nose, and throat department of a Royal Air Force general hospital complained of aural symptoms which arose during the loss of height in aircraft. One hundred cases are reviewed.

Deafness alone or in association with other symptoms was the complaint registered in 94 cases. Pain and tinnitus were often noted. The author submits both positive and presumptive evidence of the closure of the eustachian tube, and bases his conclusions on (1) the type of deafness, (2) otoscopic appearances, (3) impermeability of the tube to air, (4) impermeability of the tube to the passage of a tympanic catheter or sound, and (5) impermeability of the tube to radiopaque fluids. The author gives his own conception of tubal ventilation in the following explanation:

The tube is opened in a sinuous manner by the combined action of the sphincter of the pharyngonasal isthmus and of the upper part of the superior constrictor muscle, which drag the posteromedial cartilaginous wall inward, while simultaneously the tensor palati muscle braces the anterolateral wall against the medial pterygoid lamina and draws down the hamular process of the cartilage to relax the membranous wall.

During ascent in aircraft, as the extratympanic pressure becomes less, egress of air from the middle ear along a normal eustachian tube is easy and automatic. Most aviators are aware of a periodic and involuntary escape of air from their eustachian tubes.

During loss of height the eustachian tube behaves in an entirely different manner; for, even with a normal tube, air does *not* enter the middle ear automatically. In the majority of aviators, however, the tube is opened and ventilation of the middle ear is brought about by involuntary swallowing movements which occur at the rate of once every sixty to seventy-five seconds in normal individuals; and, in addition, all aircrew personnel are taught to practice autoinflation at every 1,000 ft. loss of height.

If ventilation of the middle ear does not take place from any cause during loss of height, a positive pressure develops outside the middle ear cleft. This occlusion is regarded as primary (pressure) occlusion; and this partially explains the obstruction.

If, however, "forced ventilation" of the middle ear is not available or is neglected for from one to two hours, the tube becomes impermeable to air even at high pressures.

It is reasonable to assume therefore that some biological change has taken place as a result of the primary (pressure) occlusion, and this the author has called secondary (vital) occlusion.

The nature of these secondary changes is not known, but it can be surmised when one views the thickness of the submucosa and the large numbers of mucous glands and goblet cells which are present in the epithelial lining of the cartilaginous tube.

Secondary occlusion is a very real entity and it may take as long as fourteen weeks to resolve, as happened in 1 patient in this series.

The etiology of this type of aural defect appears to be failure or inability to open the tube which produces primary pressure occlusion followed by secondary vital occlusion. JOHN F. DELPH, M.D.

Taterka, H. D.: Preliminary Study of the Effect of Prostigmine on Tinnitus. *Laryngoscope*, 1942, 52: 299.

There has been much written but little proved concerning the action of prostigmine in general, but it would seem from a review of the literature that prostigmine might play a dual role in the treatment of hearing disorders. Because of its supposed action on the myoneural junction it is conceived that it might augment the action of the tiny ear muscles via their nerve supply. On the other hand, recent papers would seem to indicate a very definite vasodilating action of prostigmine. Thus it would seem logical to assume that the value of prostigmine might lie in its ability to produce better circulation in the ear, thus improving nutrition and aiding the return to normal function. Either of these actions alone or in combination is well within the range of plausibility.

No attempt was made to determine accurately the effect of prostigmine on hearing. The subjects selected complained of tinnitus as their chief symptom and the study was limited to the effect of the drug on this symptom. Cases were selected regardless of the type of ear condition present, and among those treated were nonsuppurative, healed suppurative, and perceptive ear diseases. Dosage schedule in general consisted of injections of 1:2000 prostigmine methylsulfate two times a week and 3 tablets of prostigmine bromide every other day.

Twenty-one cases were treated and favorable results obtained in 54 per cent. It is interesting to note that of the 3 cases diagnosed as otosclerosis all showed improvement. Treatment should be considered for at least two months in evaluating the effect of the drug. JOHN F. DELPH, M.D.

NOSE AND SINUSES

Farmer, L., and Kaufman, R. E.: Histamine in the Treatment of Nasal Allergy (Perennial and Seasonal Allergic Rhinitis). *Laryngoscope*, 1942, 52: 255.

The authors state that specific treatment of allergic diseases has been a great step forward, but it has not solved all involved therapeutic problems.

The use of histamine in the treatment of allergic conditions appears to be theoretically sound, as this substance is very probably responsible for the symptoms and it is possible to induce a tolerance to it.

The authors have been able to treat successfully patients suffering from nasal and other forms of allergy by repeated subcutaneous injections of histamine. JAMES C. BRASWELL, M.D.

MOUTH

Martin, H.: Tumors of the Palate (Benign and Malignant). *Arch. Surg.*, 1942, 44: 599.

The palate, hard and soft, gives rise to a varied group of tumors—epidermoid carcinoma, adenocarcinoma, and benign mixed tumors. Because of the gradual transition of the cells of benign tumors into cancer, it is impossible to separate these into two definite groups. This report is based on a study of all patients with neoplasms of the hard and soft palate admitted to the Memorial Hospital for the Treatment of Cancer and Allied Diseases in New York from 1929 through 1936.

Malignant tumors of the palate make up about 8 per cent of all oral cancers. In the present series, 24 per cent were of the adenoid type including the mixed tumors. The incidence of mixed salivary-gland tumors of the palate is probably higher than the figures in the literature would indicate. The

average age of the patients on admission in the present series was fifty-seven years. The epidermoid carcinoma was found predominantly in males (90 per cent), and the adenoid tumor was found more often in females (58 per cent). Epidermoid carcinomas occurred more often on the soft palate (73 per cent), while adenoid tumors occurred on the hard palate (57 per cent). Leucoplakia, glossitis, or atrophy was found in 35 per cent of the epidermoid tumors, but there was no evidence of chronic irritation in the adenoid tumors, which usually occur about fifteen years earlier. In the present series Wassermann tests were made on 58 cases, and all had negative reactions.

The average duration of symptoms in the epidermoid carcinoma was seven months, in the adenocarcinoma twenty-seven months, and in the mixed tumor over five years. The epidermoid carcinoma was most commonly in or near the free edge of the palate (73 per cent of the cases) and the earliest symptom (in 40 per cent) was the lesion itself which was discovered as a painless irregularity of the mucous membrane. The late symptoms were very numerous and variable. The adenocarcinoma and mixed tumors both exhibited the same slowly growing, sharply delimited ovoid submucous mass. They were differentiated only by histological examination in the early stages. They rarely produced ulceration even though large in size. They were more common on the hard palate (57 per cent of the cases) than on the soft. The average duration of life from the onset of symptoms in the fatal cases of epidermoid carcinoma was one and a half years; in fatal cases of adenocarcinoma it was five years. Death in the latter group of cases was usually due to generalized metastasis.

Metastases were demonstrated clinically in 45 per cent of the patients with malignant tumors on admission and developed later in an additional 16 per cent. The epidermoid carcinoma appeared more likely to metastasize (in 69 per cent) than the adenocarcinoma, and metastases from growths of the soft palate were more frequent (in 72 per cent) than those from the hard palate. The nodes involved were the subdigastric (in 72 per cent), submaxillary (in 16 per cent), and the internal jugular chain.

The histopathology of epidermoid carcinoma does not differ from similar carcinoma elsewhere in the mouth. The classification of the adenoid tumors is very complex and confusing, and the only absolute criterion of malignancy is their capacity to metastasize.

The differential diagnosis of benign and malignant tumors of the palate may have to depend on biopsy or even on the examination of the excised specimen. The malignant tumors must be differentiated from simple ulcer, papilloma, torus palatinus, syphilis, dentigerous cyst, adamantinoma, and carcinoma of the antrum invading the bony antral floor.

The treatment of adenocarcinoma and of mixed tumors of the hard and soft palate is preferably by surgical removal. Epidermoid carcinoma of the hard palate is usually best treated by surgical removal, though occasionally radiation therapy or combinations of radiation therapy and surgical removal are indicated. In epidermoid carcinoma of the soft palate, radiation therapy is almost always the method of choice. The most efficient instrument for the surgical excision is the actual cautery, with the assistance of a chisel for the removal of the underlying palatal bone. Surgical removal of residual or recurrent tumors after radiation therapy is sometimes indicated, as may also be the removal of devitalized or radionecrotic soft tissue and bone after complete destruction of growth by irradiation. In the irradiation of palatal tumors an attempt should be made to rely on roentgen radiation perorally so as to spare the soft tissues of the cheeks and the parotid salivary glands. A total of from 7,000 to 8,000 roentgens (200 to 250 kv.) is usually given in from 300 to 400 roentgen daily doses and occasionally supplemented with the use of radon seeds of 1.5 mc. each placed interstitially.

If there is palpable involvement of the cervical lymph nodes by epidermoid carcinoma on admission, the treatment in most cases should be irradiation, but if the metastases occur at an interval after control of the primary lesion, the method may be either irradiation or neck dissection. In metastases from adenocarcinoma, neck dissection is preferable but the operation must be bilateral.

Pain occurs only in the advanced stages of cancer of the palate or following ill-advised irradiation. Radionecrosis and osteomyelitis may occur and are usually best treated by excision of the necrotic soft tissue and bone, and scrupulous care of the remaining viable tissue. Hemorrhage may occur because of erosion into the adjacent vessels. It should be controlled by local tamponade and ligation of the external carotid artery on the affected side. Palatal defects can be completely relieved by the construction and use of prostheses.

The net five-year-cure rate in 93 cases of cancer of the palate was 23 per cent. When metastases were present on admission the cure rate was only 6 per cent. The cure rate of adenocarcinomas (40 per cent) was twice that of epidermoid carcinomas (19 per cent). Age, sex, size, and location of the lesion were also factors in the five-year-cure rate.

BRADFORD CANNON, M.D

PHARYNX

Brunner, H.: Nasopharyngeal Fibroma. *Ann. Otol., Rhinol. & Laryngol.*, 1942, 51: 29.

Brunner states that surgery as well as the more conservative measures of radium and surgical diathermy is suitable for the treatment of nasopharyngeal fibromas and, thus, the question arises when to employ surgery and when to indicate the more conservative treatment. He says that his limited experience with these cases does not entirely justify definite conclusions, but at present he favors surgery in the following types of cases: in older individuals,

since we may expect a more or less extensive degeneration of the tumor tissue in such cases; and in very large tumors, because naturally a large tumor will considerably increase the time necessary for the conservative treatment and hidden extensions of the tumor may readily be overlooked if the tumor is not thoroughly exposed by surgical means.

More conservative measures seem to be indicated in the following cases: in patients who suffer from a severe hemorrhage at biopsy, which points out the possible difficulties which might arise during an operation; in cases which offer a doubtful microscopic finding of the biopsy material, which suggests a sarcomatous degeneration of the tumor; in patients with a poor general condition, which would permit surgery only after a preliminary building-up; in recurrence of the tumor, which can be more readily managed with radium and surgical diathermy provided it does not reach a considerable size; and in the presence of signs of intracranial involvement, which make the outlook questionable for any form of treatment. JAMES C. BRASWELL, M.D.

Hill, F. T.: Nasopharyngeal Fibroma, with the Report of a Case with Secondary Pneumocephalus. *Ann. Otol., Rhinol. & Laryngol.*, 1942, 51: 105.

Hill states that accurate visual examination of the nasopharynx is essential. Failure in this respect is the cause of many diagnostic errors.

Direct inspection by retraction of the soft palate is the most accurate method of examination of this region. The use of a general anesthetic for this purpose may be indicated in such cases as suspected nasopharyngeal fibromas.

While biopsy may be attended with the risk of hemorrhage in nasopharyngeal fibromas and may be dispensed with in most cases, the hazard of bleeding may be better managed if the biopsy material is taken from the nasal extension of the tumor.

The sudden onset of severe prostration and headache in a condition with the potentiality of intracranial extension should suggest the possible diagnosis of pneumocephalus.

JAMES C. BRASWELL, M.D.

Deering, W., and Brennemann, J.: Acute Abscess of the Throat. *J. Am. M. Ass.*, 1942, 118: 1171.

This report deals with 250 cases of true and potential, or abortive, abscesses in the throats of children under fourteen years of age observed in the wards of the Children's Memorial Hospital, Chicago, over a period of ten years ending December 31, 1940. In 181 of these cases there was frank suppuration, as shown by spontaneous rupture or surgical drainage. In the remaining 69 a localized inflammatory lesion, apparently differing in no way from the lesions in the early stages of the other group, subsided without evident pus formation for one reason or another.

Three main types of acute abscess of the throat were recognized: retropharyngeal, retrotonsillar, and peritonsillar. There was a fairly constant chronological setting in the different types of abscesses. The retropharyngeal abscess was almost restricted to the first two years of life; the retrotonsillar abscess came into prominence in the third and fourth years and tapered off after the seventh or eighth year; 1 peritonsillar abscess occurred in a child of five years, and the rest from the seventh year on.

All of these acute abscesses have four cardinal signs or symptoms that vary in degree but are rarely absent:

1. An infection in the throat.
2. Pain on swallowing.
3. Localized swelling in the throat. This may or may not be visible; it can always be made out by palpation.
4. Unilateral, or predominately unilateral, cervical adenitis on the affected side.

The diagnosis should rarely be missed if the condition is constantly kept in mind. The palpating finger is always more revealing as to the location and the stage of development. Palpation is easily performed, and preferably with the ungloved hand.

The prognosis is generally favorable, although there is a potential danger that should be kept in mind. There were 3 deaths in the series, only 1 of which was due directly to the abscess.

There should be advanced fluctuation before drainage is established. Healing occurs more readily and more surely if the abscess is mature; there is probably less danger of systemic infection and the necessity of reopening is reduced to a minimum. The retropharyngeal abscesses were opened with the child in the upright position.

Sulfanilamide was administered to 28 patients. Of these, 14 did not suppurate. Suppurative cervical adenitis occurred in 6.6 per cent and the incidence was inversely proportionate to the age of the child.

JOHN F. DELPH, M.D.

Graham, J. M.: The Surgery of the Hypopharynx; Pharyngeal Pouch. *Edinburgh M. J.*, 1942, 49: 145.

To Graham the following conclusions regarding pharyngeal diverticulum appear to be justified:

1. The diagnosis can frequently be made from the history and clinical features alone.
2. It can be established in every case by a simple roentgen-ray examination after the swallowing of barium.
3. Operation should be recommended unless the symptoms are comparatively slight.
4. The operation of diverticulopexy is of value if the patient is frail or appears to be in poor general condition.
5. The routine operation should be resection of the pouch in two stages. One-stage resection, if employed, should be limited to the treatment of small pouches.
6. The recorded series show that the mortality rate of the operation has been reduced to a very small figure. In the great majority of cases complete and permanent relief is obtained after operation.

NOAH D. FABRICANT, M.D.

Graham, J. M.: Surgery of the Hypopharynx; Postcricoid Carcinoma. *Edinburgh M. J.*, 1942, 49: 164.

The author's observations are based on a series of 30 cases of postcricoid carcinoma. It is apparent that little improvement in the results can be expected, whatever method of treatment is adopted, unless the cases can be diagnosed at an earlier stage. If a patient is seen when the symptoms are slight and indefinite, he should be referred to a laryngologist without delay for a complete examination. A growth of the postcricoid area may be seen with a laryngoscope when the disease is advanced, but it is only by a direct examination that the early stages of the condition can be recognized and confirmed by biopsy.

The results obtained by radiotherapy, from which so much was hoped, have so far been disappointing. Not 1 of the 46 cases of postcricoid cancer treated in the Royal Infirmary during the period from 1936 to 1937 has survived for as long as three years. The results of operation have also been far from good. A radical operation was performed in 15 cases, in 3 of which the larynx was also removed. Two of the 15 patients have survived in good health for periods of fifteen and twenty-four years, respectively. The evidence in favor of surgical measures cannot, therefore, be regarded as convincing, but it provides some justification for the conclusion that radical operation should again be considered as the method of treatment when the disease is not too far advanced. NOAH D. FABRICANT, M.D.

NECK

Storck, A. H., and Holcombe, R. G., Jr.: The Use of Estrogenic Substances in the Preoperative and Postoperative Treatment of Hyperthyroidism. *Surgery*, 1942, 11: 703.

Observations are reported on a few cases of hyperthyroidism which were given estrogen treatment before operation. No significant effect on the basal metabolic rate was shown. PAUL STARR, M.D.

Pressman, J. J.: Physiology of the Vocal Cords in Phonation and Respiration. *Arch. Otolaryngol.*, 1942, 35: 355.

Pressman points out that a fundamental knowledge of laryngeal physiology can be applied in a practical way. Whispering is a case in point. Many pathological and postoperative convalescent states are treated by vocal rest. To those familiar with the physiology involved, it is apparent that whispering can be as harmful as shouting, since the vocal cords can approximate and traumatize each other during the whisper as well as in speech, not to mention the fact that the expiratory blasts themselves produce vibrations of the vocal cords and consequent trauma.

The author cites practical applications of the physiology of the larynx and maintains that the application of the fundamentals of laryngeal physiology, and nothing else, can possibly produce clinical cure in selected cases. Discussions of fundamental basic principles require no justification, and the knowledge of such principles is, like virtue, its own reward. NOAH D. FABRICANT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Watt, A. C., and Alexander, G. L.: Epilepsy Following the Application of Sulfathiazole Near the Brain. *Lancet*, Lond., 1942, 242: 493.

Attention is called to the danger of applying sulfathiazole in proximity to the brain, particularly in the frontal region. Because of the fact that the bone flap in many craniotomy operations is largely deprived of blood, chemotherapeutic agents have been used as a prophylactic against infection in many neurosurgical clinics.

The author used sulfathiazole in the same manner as had been his custom with sulfapyridine; namely, several grams of the sterile, powdered drug were insufflated into the wound after closure of the dura, both deep and superficial to the bone flap. In the first 2 cases all went well, but in subsequent cases he observed epileptic seizures beginning about two hours after the operation and recurring in quick succession. In a series of 10 craniotomies in which sulfathiazole was used, 5 of the 6 frontal explorations were complicated by postoperative epilepsy, and there were 2 deaths among the 5 patients exhibiting this train of symptoms. None of the affected patients had a personal or family history of epilepsy. It was further noted that in 4 cases of posterior or lateral craniotomy epilepsy did not occur, although in 1 there was a history of previous epilepsy.

With 1 exception, the basal fluid spaces had been opened and exposed during operation in the cases in which epilepsy developed. The exposure, along with the placing of the drug in free accessibility to the fluid of these spaces, appears to be a factor in the development of this complication. After frontal craniotomy cerebrospinal fluid commonly accumulates under the scalp flap in considerable quantity, more so than after lateral craniotomy, and thus a copious reservoir of fluid saturated with sulfathiazole can be formed superficially. If intracranial tension is low after operation, the tidal excursion of fluid through apertures in the dura with each pulse beat contributes to rapid diffusion of the drug in solution within the cranial cavity. In 1 case the lumbar fluid contained 14.8 mgm. of sulfathiazole per 100 cc., which would indicate that quite a high local concentration of the drug in the subarachnoid space at the site of operation may be reached.

Experiments were carried out on cats and dogs with the application of the several sulfonamides to cerebral surfaces. It was observed that sulfathiazole so applied has epileptogenic properties, while the application of sulfanilamide, or of sulfapyridine, sulfadiazine, or sulfacetamide does not produce epilepsy. That heat sterilization of sulfathiazole is not responsible for its convulsant effect was proved by experiments with unsterilized material. The possibility that the thiazole part of the molecule is the epileptogen is under investigation.

JOHN L. LINDQUIST, M.D.

Schroeder, A. H.: Diagnosis and Treatment of Cerebral Hydatid Cyst (Diagnóstico del quiste hidático cerebral y su tratamiento). *An. Fac. med.*, Montev., 1941, 26: 793.

The author presents a detailed analysis of 15 cases of cerebral hydatid cyst. From this study he concluded that the typical clinical syndrome caused by a cerebral hydatid cyst was characterized by definite hypertension, few focal symptoms, good general health, and the history of a rural habitat. However, he cites a case of cerebral hydatid cyst manifested by moderate hypertension, left hemiplegia, and a general deficient condition as illustrative of the fact that the typical syndrome may be radically modified. Although some authors have placed diagnostic significance on the serological reaction of Weinberg and Casoni and on an eosinophilia, none of these was consistent enough in his analysis to be of diagnostic value. Infantilism was noted in a few of the cases. Roentgenological signs of increased intracranial pressure, cranial dysostosis, digital impressions, and modifications of the sella turcica were found in all cases studied. The author does not believe that loss of cranial substance (as suggested by Gareiso) is pathognomonic of this condition. The syndrome was not associated with manifestations of excitement in any of the cases.

In addition to the typical clinical syndrome, an encephalogram is of diagnostic significance not only for localization of the growth but also for determination of its size. Encephalography, in a typical case, will show that the ventricle contralateral to the cyst is very dilated and displaced, and the ventricle corresponding to the hemisphere occupied by the hydatid cyst is distorted and reduced in size so that it frequently appears as a thin vertical line in the anterior posterior roentgenogram and is frequently displaced beyond the midline. This is illustrated by diagrams and photographs.

The only treatment in cases of cerebral hydatid cyst is surgical removal. Following localization of the cyst and determination of its size by encephalography, the author's technique consists of a linear incision in the soft parts, an opening of from 6 to 8 cm. in diameter in the bone, removal of the cyst, repeated lavage with ether, and closure in layers without drainage. Of 12 cases operated upon by the author, 8 were cured.

The author stresses the importance of modifying the technique to suit the individual case. He cites 3 cases in which his technique was altered with satisfactory immediate operative results.

A detailed analysis of the 15 cases in table form is appended.

MICHAEL DEBAKEY, M.D.

Kredel, F. E.: Collateral Cerebral Circulation by Muscle Graft. *South. Surgeon*, 1942, 11: 235.

Improvement of the collateral circulation by means of muscle grafts has been obtained in the heart and in other parts, and this has led the author to consider applying the same principle to the brain. Although in the case of the brain the neurones die a few minutes after their blood supply is cut off, other areas of the brain may take over the function of the dead neurones provided there is a sufficient blood supply. Certain areas of the cortex probably have a blood supply insufficient for neuronal activity, yet not so deficient as to cause death of the nerve cell.

The procedure is carried out by means of a fronto-parietal osteoplastic flap. The bone in the flap is separated from the muscle and preserved in saline solution. Inferiorly the bone is rongeured away to provide an ample decompression at a later date. The dura is opened around the circumference of the bony defect and left with its basal attachment posteriorly. The piarachnoid is gently removed from each gyrus with a fine hook or, failing this, light coagulation may be used. No patent vessel should be injured. The muscle graft is prepared by cutting the muscle from the anterior two-thirds of its tendon and freeing it posteriorly. Periosteum is removed from its under surface. This is now placed on the brain and sutured to the under surface of the dura. The bone flap is wired in place with one or two wire sutures.

Three cases have been treated by this procedure—2 cases of cerebral thrombosis and 1 case of complete right hemiplegia following ligation of the internal carotid artery for intracranial aneurysm. In this case the artery has been ligated both intracranially and in the neck three months before. Myopexy was performed in December, 1941. Normal brain was seen only over Broca's area and at the tip of the left temporal lobe. During the second week the patient showed renewed interest. Two months postoperatively short words were mumbled and there was

Fig. 1. Temporal muscle in normal position showing incisions for fashioning pedicled graft.

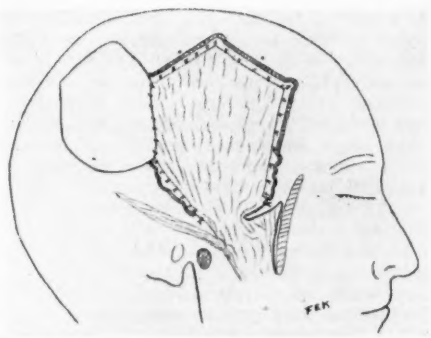

Fig. 2. Suture of muscle graft to dura around entire periphery. Base of pedicle sutured to periosteum.

movement in both the right arm and leg. Further improvement occurred during the third month. The 2 cases of cerebral thrombosis also showed satisfactory improvement following myopexy, although 1 patient had a grand mal attack four weeks after operation.

The author states that improvement may be seen about a week after operation and that no serious sequelae have occurred. Moderately severe cases of cerebral thrombosis that have failed to improve after several months are the most likely to be benefited.

ADRIEN VERBRUGGHEN, M.D.

PERIPHERAL NERVES

Dandy, W. E.: Recent Advances in the Diagnosis and Treatment of Ruptured Intervertebral Discs. *Ann. Surg.*, 1942, 115: 514.

Twelve years ago the existence of ruptured intervertebral discs was unknown. Neurosurgeons now see more ruptured intervertebral discs than any other lesion and are able to diagnose them with precision and cure them by operative means without loss of bony structure. The diagnosis and localization of a protruding disc at first depended upon lipiodol and then air injection until Semmes emphasized the characteristic clinical picture and Love and Spurling found that 96 per cent of all ruptured discs were situated at the fourth and fifth lumbar vertebrae. From bilateral laminectomy and intradural removal of the disc, the operative procedure has been simplified progressively through extradural removal, hemilaminectomy, and removal of only a notch of bone in a lamina, to the removal of a high percentage of ruptured discs through the interlaminal space without removal of any bone.

"Concealed discs" represent one-fourth of the total number of these lesions. The symptoms from "concealed discs" are the same as those from the frankly protruding discs but detection is more difficult. There is always a tiny bulge at the intervertebral space with thickening of the spinal ligament; it indents with pressure of the forceps and

gives a sense of fluctuation to the pressure. When the area is incised the forceps can be passed deeply into a cavity in the disc. When a curette is introduced macerated vertebral-disc substance is obtainable.

Two factors of a ruptured disc are responsible for the patient's symptoms: (1) the necrotic interior of the disc causes backache under pressure from edema; and (2) the protrusion upon, or adherence to, the emerging spinal nerve causes sciatica. The realization of these two elements is necessary for a cure to be certain. A large protruding disc may be withdrawn and still not cure the symptoms. It is all important that the interior of the disc be widely opened so that the sequestrum may be subsequently extruded through the opening. The author has not had a recurrence and believes that the explanation of recurrences is the failure to open the cavity in the body of the disc.

Cures may be immediate or may require several months. Bony fusion is unnecessary and inadvisable. Patients should avoid heavy lifting and back strains and should perhaps wear a brace for three months, after which time they may engage in any occupation.

The diagnosis of ruptured intervertebral disc depends upon the radiation of low back pain down the posterior aspect of one or both legs and intensification of the pain on coughing or sneezing. Reduction or loss of the Achilles reflex is of importance but not always present. At times there is hypesthesia along the course of the affected nerve. The pain is usually in recurring attacks but may become constant. The only other conditions which need be considered in the presence of continuous pain are psychoneurosis and, occasionally, tumors. The importance of a purely clinical diagnosis without the use of contrast media or spinal puncture is that these procedures are unnecessary and may give negative results when a ruptured disc is present. "Concealed discs" cannot be demonstrated by these methods and consequently 25 per cent of the patients with disc lesions would be excluded from surgical treatment.

JOHN L. LINDQUIST, M.D.

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Farber, J. E.: Unexpandable Lungs. *J. Thoracic Surg.*, 1942, 11: 424.

A series of 27 patients with unexpandable lungs is presented, and the author calls attention to a problem in collapse therapy which needs further consideration. It is true that these cases were the residuum of a large number of patients under pneumothorax treatment, but nevertheless they represent a significant group of patients.

If the several cases with bronchopleural fistula are excluded, the important factors in preventing re-expansion seem to be visceral pleural thickening (pachypleuritis) and extensive post-tuberculous parenchymal fibrosis. The importance of fixed rigid mediastinal structures in preventing the obliteration of the pneumothorax pocket is cited.

The study further directs attention to the hazards of the "dead pleural space,"—empyema, tuberculous or mixed infection, and bronchopleural fistula.

SAMUEL H. KLEIN. M.D.

Porro, F. W., Patton, J. R., and Hobbs, A. A., Jr.: Pneumoconiosis in the Talc Industry. *Am. J. Roentg.*, 1942, 47: 507.

The author briefly reviews the literature on the pathogenicity of silicates and reports 15 cases of pneumoconiosis due to exposure to talc, with 7 fatalities. In each of the cases there was a history of exposure to talc dust chronologically related to the onset of symptoms. The dust responsible for the disabling pneumoconiosis was apparently talc itself in the form of tremolite or soapstone, or both, since silica was not found nor was any other dust found in high concentration.

The symptoms are dyspnea, cough, chest pain, and weakness. Dyspnea has been the first and most distressing symptom. The gross changes in the lungs are stiffening, the presence of poorly outlined grayish bands and nodules appearing in the parenchyma, and moderate enlargement of the tracheobronchial lymph nodes. Compensatory emphysema is universally present. Extensive intrapleural adhesions are found and in all advanced cases without important complication there is cor pulmonale. The microscopic changes are also described.

In the roentgenogram diffuse haziness is the most constantly noted abnormality and is probably the earliest which is detectable in pneumoconiosis due to talc. The haziness which is found is similar to that seen in early asbestosis. The general background of the lung field may be a fine indefinite reticulation of lines, having a density only slightly greater than normal lung fields. Another manifestation is nodulation. The nodules are less dense and less well defined than those of typical silicosis. They are variable in size and tend to become confluent. The distribution is usually general but the greatest intensity is in the parahilar or subapical regions, or near the bases. These three findings, diffuse haziness, indefinite nodulations, and reticulation, may be seen in the same film and apparently constitute the essential roentgenographic criteria.

HAROLD C. OCHSNER, M.D.

Lovelace, W. R., II, and Hinshaw, H. C.: Dangers of Aerial Transportation to Persons with Pneumothorax; Roentgenographic Demonstration of the Effect of Decreased Barometric Pressure (High Altitude) and of Increased Barometric Pressure. *J. Am. M. Ass.*, 1942, 118: 1275.

Roentgenographic studies of the effects of increased and decreased barometric pressure upon pneumothorax have been made. It has been possible to demonstrate that the principle of Boyle's law applies to closed free pneumothorax. The degree of increased pulmonary collapse produced by a simulated increase in altitude, however, may be restricted by pleural adhesions, by thickening of the visceral pleura and fixation of the mediastinum. The moderate altitudes (from 5,000 to 12,000 feet) commonly attained by commercial passenger-carrying airplanes are sufficient to produce a marked increase in the size or the pressure of a pneumothorax, whether this be of therapeutic, spontaneous, or traumatic origin. The dangers attending fluctuations in degree of pulmonary collapse are discussed. The dangers are increased shortly after "refilling" of a pneumothorax, when pleural adhesions are present, when disease in the collapsed lung recently has been active, when the patient's vital capacity is limited, or when the pneumothorax is unusually extensive. Patients with a pneumothorax created for therapeutic reasons should be warned of these dangers, and physicians who care for injured persons should recall the possibility that traumatic pneumothorax might be present, and that it would present similar hazards if the patient were transported by airplane

Shaw, R. R.: Pulmonary Abscess. *J. Thoracic Surg.*, 1942, 11: 453.

Following Neuhof's report on acute putrid abscess of the lung in 1936, the results obtained in 227 cases of pulmonary abscess, treated during the period of from 1926 to 1937 at the University Hospital at Ann Arbor, Michigan, were studied by Shaw and Blackman. These cases were treated with the accepted medical and surgical procedures, including postural and bronchoscopic drainage. The two-stage technique of surgical drainage was used routinely. The general mortality was 35.7 per cent.

The author presents a series of 49 unselected cases treated in the last two and one-half years. The one-stage operation was carried out 38 times on 28 patients, this seeming inconsistency being due to

several cases of multiple abscesses. The mortality for the entire group was 14.3 per cent, while 61.2 per cent of the patients are well, and 24.5 per cent were benefited.

It is very necessary that the abscess be accurately localized in relation to the chest wall when the one-stage operation is planned. Intercostal tenderness is the most important sign, and the presence of dullness to percussion, amphoric breath sounds, and egophony, are helpful. Roentgenology is essential, and bronchoscopy is of great aid. In this series adequate adhesions were found in almost every case, which made the one-stage procedure feasible. In this operation, a short segment of rib is resected and after the absence of free pleural space is certain, the cavity is incised with a scalpel or scissors if it is thin-walled, but it is entered with the actual cautery if chronic and thick-walled. No attempt is made to unroof the cavity completely. At the end of the operation, the cavity is packed with gauze moistened with saline solution. If the free pleural space is entered during the procedure, it is closed off with mattress sutures. The two-stage technique should usually be used for abscesses pointing solely upon the diaphragm, mediastinum, or interlobar fissure.

Cases of lung abscess should be watched carefully, and subjected to surgical drainage early, if there is not continuous and progressive evidence of healing. In allowing abscesses to continue a chronic course lies the danger of progressive pneumonitis and multiple abscess formation. In this series, the mortality in the surgical cases having a single abscess was only 5 per cent, as contrasted with 30.8 per cent in those with multiple abscesses. Residual pulmonary conditions such as residual cavities, bronchiectasis, and bronchial fistulas are less frequent after the one-stage operation on acute abscesses. Lobectomy and pneumonectomy still hold an important place in the treatment of lung abscess, and must be employed at times. Phrenic paralysis is often advantageous as a prophylaxis against recurrence and also to help close defects following drainage, but is seldom indicated in active treatment of the abscess.

The author concludes that the mortality is low and the percentage of cure high in surgical drainage of acute abscesses; that is, in cases of less than six weeks' duration. H. C. JERNIGAN, M.D.

Neuhof, H., Rabin, C. B., and Sarot, I. A.: A Topographic Classification of Cancer of the Lung, with Special Reference to the Surgical Implications of the Circumscribed Variety. *J. Thoracic Surg.*, 1942, 11: 388.

Gross topographic features were studied with special reference to operability in 281 cases of primary cancer of the lung. Of these, 114 cases were studied in detail by operation, autopsy, or both.

The cases were divided into two topographic groups, the circumscribed and the noncircumscribed, on the basis of gross (macroscopic) features. Origin from a branch bronchus could be seen in most circumscribed tumors which were peripherally invasive. A bronchial origin could be seen in all cases of noncircumscribed tumors. Five-sixths of the latter group had their origin in large bronchi, and only one-sixth, in branch bronchi.

The circumscribed tumors comprised 29 per cent and were characterized topographically by sharp delimitation from adjacent pulmonary tissue. Distinctive roentgenological features whereby they could be diagnosed existed in the vast majority. Of the symptoms which generally were less marked than in the noncircumscribed group, pain was the most common and the most prominent. Regional lymph-node involvement was rare, but hematogenous metastases were more common and the chief reason for inoperability. Another reason for inoperability was the frequent situation of circumscribed tumors in the apical and paravertebral segments of the upper lobes, which resulted in local invasion of the vital structures. Forty-six (or 57 per cent) of the tumors were clinically operable. Twenty-nine patients were operated upon, of whom 16 were free of regional node involvement and 6 had minimal node involvement. The remaining 9 were inoperable because of direct invasion.

The noncircumscribed tumors comprised 71 per cent and were characterized topographically by invasiveness. The most common roentgenological feature was atelectasis with or without tumorous or pneumonic infiltration. The film may reveal only carcinomatous lymphangitis or be completely negative. The most common symptoms were cough and hemoptysis. Early and extensive lymphatic invasion was common and was the chief reason for inoperability. Only 58 of 199 cases (39 per cent) were clinically operable. Thirty-one patients were operated upon, of whom 9 were operable (with no regional node involvement, or with involvement of the lymph nodes only in the removed specimen). In only 9 of the 199 cases was there no regional lymph-node involvement.

Positive bronchoscopic biopsies were obtained in 75 per cent of the noncircumscribed and in 42 per cent of the circumscribed tumors. In the latter group positive biopsies were obtained chiefly in cases of lower-lobe tumors.

The authors conclude from their studies that despite the approximately equal duration of symptoms in both groups, circumscribed tumors are more frequently amenable to surgical extirpation because of the relative infrequency and more limited extent of regional lymph-node involvement. Since symptoms are often insignificant and bronchoscopic biopsy is negative, exploratory operation is often warranted. In cases of noncircumscribed tumors characterized by atelectasis in which bronchoscopy is negative, exploratory operation is justified when inoperability has not been determined from other evidence.

Pneumonectomy would probably always be indicated in cases of noncircumscribed tumor. On the other hand, lobectomy or even partial lobectomy may be justified in selected cases of circumscribed tumors. JOSEPH K. NARAT, M.D.

Ochsner, A., and DeBakey, M.: The Significance of Metastasis in Primary Carcinoma of the Lungs. *J. Thoracic Surg.*, 1942, 11: 357.

At present, primary carcinoma of the lung has a high incidence of metastasis at the time the diagnosis is made. On the other hand, an encouraging number of these lesions are characterized by late and limited metastases. For this reason the incidence of operability can be increased. The determination of the type of lesion, its location, and the presence of demonstrable metastasis are of prognostic and surgical significance. An adequate knowledge of the methods and routes of spread in carcinoma of the lung is also extremely important. Realization of the relative incidence of metastatic involvement at the various sites and a knowledge of the lymphatic drainage of the lungs permit a more careful examination of the patient and a more thorough determination of the presence of metastases, as well as a rational conception of the type of surgical procedure which should be instituted.

The relative incidence of metastases to various organs and lymph nodes, based on a collected series of 3,047 cases, is presented by the authors. The most frequent sites of metastatic involvement, as might be expected, are the regional lymph nodes in the peritracheobronchial and mediastinal areas, which clearly attests to the importance of the lymphatic route of metastasis in primary carcinoma of the lung. The next most frequent site of involvement is the liver. The pleura and lungs form the next most frequent sites of metastases. There are some differences of opinion regarding the next most frequent sites of involvement, and apparently they depend to a great extent upon the thoroughness of examination at the autopsy table. The frequency of metastasis to the central nervous system is particularly interesting and is additional evidence of the hematogenous route of metastasis in primary pulmonary carcinoma. Of particular interest is the occurrence of metastases to the skin and subcutaneous tissues.

The incidence of metastases in primary carcinoma of the lung is relatively high and the sites of involvement are usually widespread. It would seem that no part of the body is immune to metastatic invasion. This is due probably to a number of factors, such as the character of the tumor, the ready access to the systemic circulation, the lack of a filtering barrier, and the abundant lymphatic communications.

The modes of metastatic extension in primary carcinoma of the lung may be outlined as follows: (1) direct extension, (2) bronchial intraluminal extension, (3) implantation by aspiration biopsy or operation, (4) hematogenous extension, and (5) lymphatic extension. The lymphatic drainage of the lungs is briefly described, and the various possibilities of metastatic extension by this route are indicated. The hematogenous route of metastasis is perhaps the most important, not only because of its frequency, but because it is usually responsible for the presence of widespread distribution.

Two cases of pneumonectomy for primary carcinoma of the lung, in which metastasis subsequently developed in the axillary nodes, are presented by the authors. JOSEPH K. NARAT, M.D.

Shenstone, N. S.: Experiences with Total Pneumonectomy. *J. Thoracic Surg.*, 1942, 11: 405.

This report is based upon the experience gained from a series of 22 cases in which total pneumonectomy was done—in 13 cases for bronchogenic carcinoma, in 4 for nonmalignant tumors of the lung, and in 5 for inflammatory disease of the lung. The author's first operations for bronchogenic carcinoma, which were performed before January, 1938, proved fatal. Although the condition in 3 of these 4 patients should have been considered inoperable, the experience gained from these cases aided materially in determining the management of the 18 subsequent cases, only 2 of which terminated fatally—a mortality of 11.1 per cent.

A one-stage operation was used in the latter series and is strongly recommended when possible. Intratracheal ether or cyclopropane anesthesia was used in most of the cases. A posterolateral approach through the fifth or sixth interspace was employed in preference to the anterior incision, because of better exposure. Dissection technique was used in 15 of the 18 patients, the vessels being separately and doubly ligated with fine silk; the distal ligature was transfixed. While complex methods of closing the bronchus were used in the earlier series, a simpler method was adopted, i.e., a row of interrupted fine silk sutures was placed 3/16 in. distal to a pair of light Kocher forceps applied immediately below the tracheal opening. The closure was then completed by a running suture of chromicized catgut. In 2 patients, the silk sutures were omitted. Sulfapyridine was then powdered over the adjacent raw area and the pleura was sutured over the stump. No fistulas developed although there were 3 instances of pleural infection.

Of 9 patients with bronchogenic carcinoma who underwent surgery since January, 1938, 2 died; both of them were beyond permanent cure had they recovered from the operation. Of the remaining 7, 1 died ten months, and 1 eight months after the operation. The other 5 have lived for periods up to three years without evidence of recurrence. Empyema developed in only 1 of the 7 survivals, and this occurred two weeks after the patient had returned home. Satisfactory recovery followed drainage of the empyema.

Three of the patients with nonmalignant tumors of the lung had bronchial adenomas, and 1 a cavernous hemangioma. Complete recovery followed removal by total dissection pneumonectomy.

Of the 5 patients with inflammatory disease of the lung, 2 had tuberculous stenosis of the primary bronchus. Operation was preceded by postural drainage for one month, which improved the general condition. The main bronchus measured only 6 mm. in diameter, with a lumen only 2 mm. wide. Both patients recovered. Two patients with lung abscess

and 1 with bronchiectasis underwent total pneumonectomy and all 3 recovered. One of the former developed an empyema for which a thoracoplasty was later performed. WILLIAM E. ADAMS, M.D.

Lynch, J. P., and Strieder, J. W.: Hemothorax Complicated by Infection with Clostridium Welchii. *N. England J. M.*, 1942, 226: 685.

A case of hemothorax complicated by infection with clostridium welchii is presented.

A review of the literature reveals that such a complication is rare in civil practice but common in the surgery of war injuries.

From the cases reported, and from their experience with this case, the authors believe that early open drainage is the treatment of choice, but that it should be supplemented with specific antitoxin, chemotherapy, and x-radiation. SAMUEL H. KLEIN, M.D.

HEART AND PERICARDIUM

Nicholson, J. C.: Cardiac Massage. *Brit. M. J.*, 1942, 1: 385.

The subject of restarting the heart's action by cardiac massage is of great importance, and is one which is constantly recurring in the medical literature. The author discusses his experience in 7 patients, 2 of whom lived, and 5 of whom died.

In his opinion the heart may suddenly stop during operation for one of two causes. The first cause is failure of the heart as a terminal event in a mortal illness, such as late intestinal obstruction or general peritonitis, or as the result of an operation in the emaciated and aged. The other cause is presumably failure either from reflex inhibition or possibly as a result of the toxic action of the anesthetic agent. In these cases cardiac massage is generally successful in initiating the heart beat and should be resorted to at once.

The author then describes the operative procedure he uses, and emphasizes that an immediate decision must be made if this type of patient is to be saved. The operation is transabdominal through a small incision, the incision being just large enough to admit the hand; the heart is then massaged through the diaphragm. PAUL MERRELL, M.D.

Beck, C. S.: Further Observations on Stab Wounds of the Heart. *Ann. Surg.*, 1942, 115: 698.

The best way to stop bleeding from a ventricle is by placing a finger upon the wound, not in it. Fingers can be placed upon the wound and can be kept on the wound fairly well if the heart is steadied with a suture. The suture is passed through the apex because this region is farthest from the major coronary artery. When the wound lies along a coronary artery the method of suture should spare the artery. In laceration of the auricles, the technique for closure is to grasp the margins of the wound in small hemostats. The wound is then closed with a suture or a mass ligature. Bleeding from the surface of the heart can be controlled with a superficial suture in the muscle at the bleeding point and a small muscle graft beneath the suture. This graft, it is said, can be loosely anchored over a coronary vein or coronary artery in such a way that the vein does not bleed and the artery is not occluded.

It has been found that the administration of fluid intravenously has beneficial effects on the patient with compression of the heart in whom there is some blood escaping from the pericardial sac. In the patient with compression of the heart in whom there is no blood escaping from the pericardial sac, the administration of fluid intravenously does not produce a rise in arterial pressure.

RICHARD J. BENNETT, JR., M.D.

Doane, J. C., and Pressman, R.: Ante-Mortem Diagnosis of Tumors of the Heart. *Am. J. M. Sc.*, 1942, 203: 520.

The authors have given a review of the literature on the frequency and character of tumors which on post-mortem examination were found to have metastasized to the heart and on the smaller group of such tumors which were diagnosed before autopsy.

In 1917 Symmers reported that among 298 cases of malignant disease found in 5,155 autopsies at Bellevue Hospital, there were 5 instances of metastases to the myocardium (1.6 per cent). Yater reported 9 cases of tumors of the heart in 1931 and in 1934 Burke reported 14 cases of metastatic involvement of the heart among 327 cases of malignant tumors (4.3 per cent). Lymburner in 1934 reported on 8,550 autopsies at the Mayo Clinic, with 52 metastatic tumors of the heart, 4 of which were considered primary. In 1935 Helwig found 9 cases of metastatic involvement of the heart among 1,000 autopsies and compiled 98 cases from the literature in a total of 41,000 autopsies. Pollia and Gogal found 29 neoplasms of the heart among a total of 12,000 autopsies, in 1,450 of which malignant tumors were found. Scott and Garvin reviewed 11,000 consecutive autopsies in 1939; they found 1,082 cases of malignant tumors, 118 of which had metastasized to the heart or pericardium. Lisa, Hirschorn, and Hart reported 4 tumors of the heart in 1941, 1 of which was diagnosed before death.

The review of the literature produced reports of 19 cases in which the tumor in the heart was diagnosed prior to death. Thirteen of these were sarcomas and 7 carcinomas. The authors add 1 case of their own, that of a patient known to have been suffering from a malignant uterine tumor for three years prior to her death. Among their collected cases, the primary tumor involved the bronchus or lung in 5 cases, tissues of the head in 4 cases, and the uterus, adrenal gland, liver, femur, and mediastinum in 1 case each. In 2 cases the source of the primary tumor was not stated.

The clinical picture of the cases with tumor involvement of the heart fall into 2 groups. In one group the symptoms are obscure, e.g., sudden and unexplained temporary congestive heart failure, symptoms of subacute bacterial endocarditis, or

sudden and unexplained death. In the second group the symptoms are more suggestive of the lesion present; there may be various abnormalities of cardiac rhythm, or congestive heart failure without apparent cause in a patient suffering from carcinoma, or rapidly developing pericardial effusion. The most suggestive finding is fixation of the right heart border on fluoroscopy. MARIAN BARNES, M.D.

ESOPHAGUS AND MEDIASTINUM

Cohen, W., and Sindell, E. A.: Esophagopleural Fistulas. *West. J. Surg.*, 1942, 50: 238.

A case of esophagopleural fistula complicating a tuberculous empyema is reported, along with a summary of 16 additional cases collected from the literature.

The patient was a thirty-year-old white female who had been treated by pneumothorax for pulmonary tuberculosis for one year. A tuberculous empyema followed, although the sputum became negative. Subsequently a mixed infection of the pleural space developed, and with it a definite bronchopleural fistula was demonstrated. The patient began to complain of a burning sensation in the throat following irrigations of the pleural space. A barium swallow demonstrated an esophagopleural fistula. Although a Levine tube was passed into the stomach for feeding and the pleural cavity was drained, the patient gained little, and two weeks later died with symptoms and signs of intraperitoneal hemorrhage.

Postmortem examination revealed (1) chronic fibroid pulmonary tuberculosis with cavitation on the side of the empyema (left), and caseous and calcified lesions in the entire left lung; (2) miliary tuberculosis of the right lung, liver, spleen, kidneys, brain, and cervical glands; (3) caseous lesions of both kidneys; (4) tuberculous empyema (left); (5) esophagopleural fistula (tuberculous); (6) pleuroperitoneal fistula (artificial); (7) tuberculous ulcers of the esophagus; and (8) rupture of the spleen with hemoperitoneum.

MacDonnell, in 1844, reported the first case of this type, and reports of the remaining 15 collected cases appeared between that date and 1939. Over two-thirds of the reported cases occurred in males, and the ages varied from sixteen months to fifty-nine years. Among the 17 reported cases, 7 were tuberculous and 6 were nontuberculous; tuberculosis was not mentioned in 4. The left pleural cavity was involved in 9 cases, the right in 7, and the site of involvement was not stated in 1 case. The fistula was located near the bifurcation of the trachea in the majority of the cases.

The clinical picture may include one or more of the following conditions: dysphagia, vomiting of pus, increase in toxicity, foul fatty expectoration, food particles in the pleural drainage and the development of a pneumothorax, sudden increase in the amount of pleural drainage, and the tasting or vomiting of irrigating fluid.

The prognosis of this complication in chronic tuberculous empyema is poor; however, in acute nontuberculous empyema it is usually good. Treatment includes prevention of oral contamination of the pleural space, adequate pleural drainage, and obliteration of the empyema.

WILLIAM E. ADAMS, M.D.

MISCELLANEOUS

Poer, D. H.: The Effect of Removal of Malignant Thymic Tumor in a Case of Myasthenia Gravis. *Ann. Surg.*, 1942, 115: 586.

The frequent association of thymic abnormalities with myasthenia gravis has been noted by an increasing number of observers. Thus, in a total of 129 autopsies and operations performed in cases of myasthenia gravis which were collected from the literature, thymic lesions in the form of persistence, enlargements, or tumors have been found in 71 instances, or 55.04 per cent. Such consistent findings in more than 50 per cent of myasthenias would indicate, without question, some intimate connection between such thymic lesions and the disease process itself.

The type of lesion found in the thymus in the 71 autopsies and operations was noted to be an enlargement or persistence in 30 instances, and a definite tumor in 41 instances. Of the latter, 37 were described as benign thymomas, and 4 were classified as malignant tumors. The 4 malignant tumors were found at autopsy.

The author reports the case of a man of fifty-two, suffering from myasthenia gravis in association with a tumor in the anterior mediastinum, with marked clinical improvement following excision of the tumor. It was the consensus of several pathologists that the tumor was a carcinoma of the thymus of relatively benign or low-grade malignancy. Two pathologists classified it as a definitely malignant thymic tumor, as described by Symmers (perithelioma).

According to the author, this apparently is the only case of this type that has been recorded during the life of the patient. The marked clinical improvement that has resulted adds to the growing evidence that the thymus is partly if not entirely responsible for the disease. This experience, plus that of Blalock and his collaborators, would indicate that every patient suffering from myasthenia gravis should be offered the possible benefits of removal of the thymus regardless of the presence of a definite tumor. SAMUEL H. KLEIN, M.D.

Harrington, S. W.: Diaphragmatic Hernia in Children. *Ann. Surg.*, 1942, 115: 705.

Diaphragmatic hernia occurring in infants and children presents many problems of diagnosis and treatment that differ markedly from those caused by such hernias occurring among adults.

The more common types of diaphragmatic hernias seen among infants and children are those due to

embryological structural defects of the diaphragm, namely, pleuroperitoneal hiatus hernias and those caused by congenital absence of the diaphragm. Next in probable order of frequency are esophageal hiatus and traumatic hernias.

In a series of 304 cases of diaphragmatic hernia in which operation was performed at the Mayo Clinic, 283 of the patients were adults and 21 were children twelve years of age or less.

The urgency of establishing a diagnosis is not as great in the case of adults as it is in the case of infants. Many of these infants are born with a rapid feeble pulse, are cyanotic, and are often considered to have cardiac disease. When infants present symptoms of cardiac or respiratory difficulty the thorax should be examined immediately; if possible, a roentgenogram should be made, and if a hernia is present, treatment should be instituted immediately.

The most marked immediate symptoms of traumatic hernia usually are respiratory and circulatory embarrassment. The sudden onset of symptoms in cases of traumatic hernia usually is directly attributable to the injury and there is rarely a question as to the clinical diagnosis. Surgical treatment is demanded because of the danger of cardiac and respiratory failure or because of intestinal strangulation.

The urgency of and the indications for surgical treatment in the cases of infants and children differ from those in the cases of adults because of the more frequent occurrence of hernias caused by structural deficiencies of the diaphragm among the former. This type of hernia demands immediate surgical intervention because the longer the interval between birth and operation the greater the technical difficulties and the greater may be the hazard of operation. If operation is delayed for a long period, the abdominal viscera will have lost their right of residence in the abdomen in that the abdominal cavity will not have developed sufficiently to contain them and there will be marked increase in the intra-abdominal pressure when the viscera are placed in the abdomen. At birth, the defect is relatively smaller in proportion to the size of the thorax than it is later in life.

One of the chief dangers associated with the repair of these hernias is marked alteration of the intrathoracic or intra-abdominal pressure.

In congenital hernias of infants it is very important to remove carefully the herniated viscera from the thorax directly into the abdominal cavity and not permit the intestine to be exposed or injured with sponges any more than is absolutely necessary, as this adds a great deal to the shock of the operation. Great care should be exercised in replacing the viscera in the abdomen so as not to produce a volvulus or cause any interference with the blood supply.

The results of operation in this series of 304 cases of various types of diaphragmatic hernia were 15 deaths following operation in the entire series, or an operative mortality of 4.9 per cent. Eleven of the deaths occurred among the adults and 4 among the children.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Rothenberg, R. E., and Rosenblatt, P.: Motility and Response of the Great Omentum; Fluoroscopic Observations on the Omental Activity of Dogs. *Arch. Surg.*, 1942, 44: 764.

Rothenberg and Rosenblatt report their observations on omental motility and response based on experiments on 4 dogs in which they sutured various roentgenographically opaque bodies into the free border of the great omentum. Normal conditions were simulated closely in all 4 experiments.

In all instances respiration caused longitudinal omental movement, but no lateral or axial movement was observed. Introduction of a foreign body (needle) produced no response. Vomiting or defecation, likewise, did not produce omental motility. Irritation of the peritoneum by implanting large doses of virulent colon bacilli at a site within reach of the great omentum did not cause the omentum to move to the site of irritation and neither did the omentum take part in the localizing process.

EARL GARSIDE, M.D.

Douglas, D. M.: Strangulated Hernia. A Consideration of Some Factors Affecting the Mortality. *Brit. M. J.*, 1942, 1: 354.

The author reports a study of 551 cases of external abdominal hernia—inguinal, femoral, and ventral—which were treated surgically. Of these hernias 448 were simple and 103 were strangulated. In the simple group the inguinal hernia predominated, while in the strangulated group the femoral hernia was more frequent. Fifty-seven per cent of the patients were over sixty years of age. The sex distribution was striking—31 of the 34 inguinal strangulations occurred in males, and 43 of the 51 femoral hernias and 16 of the 18 ventral hernias occurred in women. Of the 103 patients with strangulated hernia 17 (16.5 per cent) died. The largest number of deaths from a single cause resulted from pulmonary complications.

The age of the patient is a most important factor in the prognosis. Not a single death from strangulation occurred in a patient under fifty years of age. The mortality rose progressively with age. It was also noted that old men withstood operative procedures better than old women, and that the mortality rose progressively as the duration of the symptoms increased.

Further analysis of this series of cases disclosed: (a) that a patient with a strangulation of more than four days' duration faced a 1 to 5 risk of requiring enterectomy; (b) that the strangulated inguinal hernia is a more benign type of lesion than any of the others; and (c) that the presence of gangrenous bowel in the hernial sac reduces the patient's chance of survival to about one-half.

The two outstanding prognostic factors (in this series, at least) appear to be the age of the patient and the duration of the strangulation.

J. M. MORA, M.D.

GASTROINTESTINAL TRACT

Zimmerman, C. A. W.: Volvulus of the Stomach. Report of a Case. *J. Missouri State M. Ass.*, 1942, 39: 139.

There are numerous reports of misplaced stomachs associated with other abnormalities, such as diaphragmatic hernia, in the literature; but volvulus of the stomach without other concomitant changes is exceedingly rare. This statement is borne out by the author's appended bibliography in which mention of only 4 reports is made. Singleton is quoted, as he suggested a classification which Zimmerman thinks is satisfactory: viz.,

1. a. Organoaxial rotation
   b. Mesenteric axial rotation
2. a. Total
   b. Partial
3. a. Anterior
   b. Posterior
4. a. Secondary
   b. Idiopathic
5. a. Acute
   b. Chronic

Rinehart's reports of 1926 and 1936 mentioned no diaphragmatic hernias, but presented complications as in Zimmerman's case, namely, urticaria, cholelithiasis, and enlarged spleen. Azmy and Marey, in 1932, advanced the theory that "the gas distended rising transverse colon was responsible by carrying the greater curvature of the stomach upward and forward by reason of a long gastrocolic omentum." Zimmerman's case is rare, and evidence tends to show that it might have been acquired.

The author's patient was a housewife, sixty-four years of age, who on May 25, 1938, complained of itching and swollen areas all over her body—typical urticarial wheals on the face, arms, hands, legs, and torso—and dyspnea whenever the pharynx was involved. The condition had begun three months previously with intermittent attacks of irregular duration. For four years the attacks had begun in June and lasted three or four weeks, but this year they began in February and persisted to May. She tried different foods without definite results and lost 6½ lb. Her history showed that she had never been well, but rarely had consulted a doctor. She had had 12 or more gall-stone colics during the last four years, and frequent attacks of right hemicrania with emesis.

The patient had been married fifteen years and had had 4 pregnancies. She had 5 children, 1 twin having died when 1 month old. During the first labor the doctor made great pressure over the large

spleen, which was fixed but "was torn loose" as a result of his treatment; and a number of years thereafter this organ could be "pushed around" in the abdomen.

The general condition was good. Her weight was 124½ lb., temperature 98.6° F. and her skin showed 25 urticarial wheals. Her pulse was 84, and her blood pressure 130/83. There were no masses palpable in her abdomen, and there was some tenderness on the left side.

Roentgen examinations (fluoroscopic) showed the chest and diaphragm to be normal, and the heart shadow in the left chest was normal.

The small meal showed the deglutition to be normal, but peculiar; the rugae were not traced satisfactorily, and the pylorus not found. The full meal revealed saccular structure, motility free and painless, and no peristalsis was noted. On palpation the pyloric opening was found to be behind and above the saccular atypical stomach—no typical cap or ring could be elicited. The duodenum filled on pressure, its course being obliquely downward and to the right. There was no bowel action for twenty-four hours; and the meal was found between the cecum and middescending colon in sharply incised masses. A small bit of the appendix was visible. Bowel mobility was free on respiration and palpation, and only over the descending colon was there any pain, the cause of which was not identified until later when it was learned that this was due to a misplaced spleen with sclerotic vessels.

At autopsy the spleen was made mobile, and when traction of the spleen was made downward and forward, or downward and medially, the corpus and fornix of the stomach came along with it for quite some distance and the esophagus became elongated. This process caused the stomach to relax at the incisure and the pylorus; the mobile first portion of the duodenum was then inclined to tilt upward and fold medially, especially in front of the corpus.

A large spleen extensively mobile for a number of years may displace and tip upward the greater curvature of the stomach, which in the course of time, and, as the result of such insults, may be held in that abnormal position. Such a process may have brought about the condition presented in this case. The fenestrated gastrocolic omentum and the continued exertion of splenic traction, would compel the tail of the pancreas and splenic vessels to follow the direction of the pull in a marked degree. The effect of this tugging in various directions for a long period of time would quite easily result in a pronounced sclerosis.

Phlebosclerosis is also an accompaniment of splenic anemia.

The large spleen was evidently the result of Banti's disease, since this is the one disease with splenomegaly of long duration, which can be cured by splenectomy.

The volvulus making traction on the esophagus may well account for the patient's back pains.

MATHIAS J. SEIFERT, M.D.

Williams, H.: The Surgical Treatment of Congenital Pyloric Stenosis of Infancy; a Review of 400 Cases. *Med. J. Australia*, 1942,1: 303.

Four principles necessary in the surgical treatment of congenital pyloric stenosis of infancy are enumerated by the author: (1) correction of the alkalosis, chloride deficiency, and dehydration; (2) relief of the pyloric obstruction; (3) maintenance of the infant's nutrition; and (4) prevention of infections.

Alkalosis and infections were the two main causes of death, being responsible for 38.6 and 40.9 per cent, respectively, of the deaths in a series of 294 infants treated surgically from 1928 to 1938.

In a series of 84 infants with pyloric stenosis, 37 per cent (approximately) had a severe degree of alkalosis and chloride deficiency, 33 per cent (approximately) a moderate degree, and 30 per cent (approximately) a mild degree.

The alkalosis and chloride deficiency can be corrected by the slow administration of from 600 to 1,200 cc. of normal saline solution by the continuous intravenous drip method.

The mortality rate of a series of 106 infants treated surgically from 1938 to 1941 was 2.8 per cent, as compared with the mortality rate of 15 per cent in a series of 294 infants treated surgically from 1928 to 1938.

The difference in mortality rates in the two series is attributed to the use of adequate preoperative saline therapy, which has abolished death due to alkalosis; to the adoption of a method of isolation nursing, which has considerably reduced the incidence and mortality of cross-infection; and to the use of blood transfusion for the very sick infants, which has eliminated deaths from inanition.

The postoperative progress of the 106 infants of the series from 1938 to 1941, as judged by the average daily gain in weight and average duration of stay in hospital, is better than that of the 294 infants in the series from 1928 to 1938, and this must be attributed to more effective treatment before and after operation.

JOHN J. MALONEY, M.D.

Allen, A. W., and Welch, C. E.: Gastric Resection for Duodenal Ulcer. *Ann. Surg.*, 1942, 115: 530.

American surgeons have approached radical operative procedures for duodenal ulcer in a cautious manner. This is but natural since only a small percentage of all patients with duodenal ulcer fail to respond to conservative medical measures. It has taken some time to realize that in the small group of patients with intractable ulcer, palliative operations are associated with a high percentage of failures.

In the case of duodenal ulcer, one is dealing with a poorly understood disarrangement of normal physiology. Hyperacidity, tissue susceptibility, psychological disorders, and various other factors of temperament, environment, and economics play a role. In some instances the location of the ulcer makes healing very difficult, and, if healed under ideal conditions, it is prone to recur, even in spite of adequate

guidance by the physician and co-operation on the part of the patient. Thus the problem arises of protecting the patient from repeated or continuous disability, from episodes of massive hemorrhage, and from repeated perforations.

About 10 per cent or less of all duodenal ulcers are referred to the surgeon because of massive hemorrhage or intractability. Approximately 20 per cent of all patients with duodenal ulcer who are admitted to large urban hospitals, demand surgical treatment. Acute perforation accounts for about one-fourth of all operative cases. Cicatricial obstruction from long-standing duodenal ulcer is the indication for operation in the remaining one-third of the patients. Intractability and massive hemorrhage demand surgical treatment in the remaining 10 per cent. In this group, palliative operations, such as gastroenterostomy, pyloroplasty, gastroduodenostomy, and local excision without removal of the antral mucosa, are all attended with a high percentage of persistent symptoms and anastomotic jejunal ulcer.

In the Massachusetts General Hospital, the mortality following subtotal gastrectomy was not greater than that following less extensive operations. In the patients operated upon from three to nine years prior to this report, the results of true partial gastrectomy were excellent or good in all but 2 patients.

Two-thirds of 67 jejunal ulcers following palliative procedures for duodenal ulcer occurred within two years of the original operation in the authors' clinic. Among 76 subtotal resections performed during the past thirty-four months, no jejunal ulcer has thus far developed. This is believed to be the procedure of choice.

In complicated, extensive ulceration, one is justified in resection for exclusion provided the antral mucosa is removed at the original procedure. The poorest results were in those cases with resection for exclusion without removal of the antral mucosa. In this group there were 5 jejunal ulcers among 9 operative survivors. JOHN W NUZUM, M.D.

Prat, D.: Diagnosis of Early Cancer of the Stomach (El diagnóstico del cáncer gástrico incipiente). *Arch. urug. med.*, 1942, 20: 25.

The author's conclusions are based on observations of 139 cases of gastric cancer, among them 106 men and 33 women. Of the 106 cases in men 66 were inoperable; in 27 a palliative gastroenterostomy was performed, and only in 13 patients, or 12 per cent, a gastric resection could be done. In 8 of them an operative cure was obtained. Of the 33 cases in women, 21 were inoperable; in 9 a gastroenterostomy was performed, and only in 3 cases, or 9.9 per cent, a gastric resection could be done. An operative cure was obtained in 1 of the 3 cases. Of the entire material only 11 per cent were suitable for an operation. The author concludes that neither clinical observations nor laboratory studies are adequate to reveal an incipient gastric cancer, and only x-ray studies can establish an early diagnosis.

Precise and inflexible rules must govern the technique of the roentgenological examination. The error of dismissing patients with digestive complaints should not be committed if the roentgenological examination furnishes negative results. Vigilance is indicated, especially in patients from forty to sixty years of age; clinical, laboratory, and roentgenographic examinations, repeated at intervals of from twenty to thirty days, are advisable.

For an early diagnosis of a gastric cancer it is indispensable to have highly qualified personnel and most modern x-ray equipment.

It goes without saying that surgery is indicated as soon as the diagnosis of an early sarcoma of the stomach has been made. JOSEPH K. NARAT, M.D.

Schwartz, A., Reingold, I., and Necheles, H.: Investigation of the Relationship Between the Blood Sugar and General Complaints Following Subtotal Gastric Resection. *Am. J. Digest. Dis.*, 1942, 9: 151.

It is known that a small group of patients, following subtotal gastric resections, complain of nausea, epigastric distress, weakness, dizziness, palpitation, and fatigue following a meal. These complaints usually last for half an hour and slowly disappear. It was thought that these complaints might be due to hypoglycemia as the result of the more rapid emptying time of the stomach and a more rapid absorption of glucose in the intestines. In the experience of the writers, they have associated these distress symptoms following a meal with distention of the remainder of the stomach and particularly of the duodenum and jejunum. Whether a low Vitamin C plasma content is a factor has not been determined.

Fourteen patients having undergone subtotal gastric resections and 1 patient with a gastrojejunostomy were subjected to an oral sucrose tolerance test. No relationship was found between the blood sugar level and the complaints. The writers believe that such complaints in these patients are due to distention of the upper small bowel and can be eliminated by the taking of frequent small meals or by lying down after a meal. No relation between the plasma Vitamin C level and blood sugar levels to the symptoms was observed.

JOHN W. NUZUM, M.D.

Foss, H. L., and Summers, J. D.: Intestinal Obstruction from Gall Stones. *Ann. Surg.*, 1942, 115: 721..

Intestinal obstruction from gall stones carries one of the highest mortalities among the various causes of acute bowel obstruction. Because the obstruction is at first partial, recognition comes late, usually after total obstruction in a gravely ill patient.

The authors present an analysis of 10 personally treated cases together with a review of 140 cases from the literature.

The incidence of gall-stone obstruction in relation to other causes of intestinal obstruction varies from 1 to 5 per cent. The occurrence of the condition

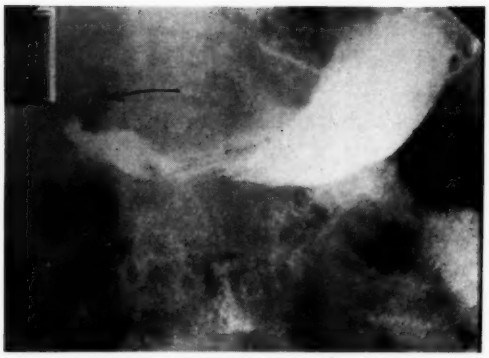

Fig. 1. Roentgenogram of stomach and duodenum of patient with cholecystoenteric fistula. Arrow points to projection of opaque medium through fistulous tract, uniting gall bladder and duodenum with gas bubble, immediately above, in gall-bladder fundus. (Courtesy of J. B. Lippincott Co.)

in the female bears the same relation to that in the male as does cholelithiasis, namely 6 to 1. The youngest and oldest patients in the series of 150 cases were thirty-one and eighty-three years, respectively, with 55 of the patients in the sixth decade and 41 in the seventh decade.

The entrance of a stone into the intestinal tract, large enough to cause obstruction, is almost always a cholecystoenteric fistula. These fistulas are usually between the gall bladder and the duodenum but may occur between the gall bladder and the stomach, jejunum, ileum, or colon.

The process of perforation begins with cholelithiasis followed by ulceration and erosion of the gall-bladder wall, and fistulous-tract formation. Associated pericholecystitis causes adhesions between the gall bladder and some portion of the intestine and the perforation, occurring within this mass, does not give rise to an associated peritonitis.

Intestinal obstruction may occur without the actual entrance of the gall stone into the lumen of the intestine. Two instances have been cited in which the stone perforated into the mesentery of the bowel and the subsequent tumefaction and abscess formation were sufficient to produce obstruction.

The symptoms of intestinal obstruction due to gall stones are less clear cut than when the obstruction is due to other and more common causes. Essentially the clinical picture is that of ileus but there are certain features which may suggest that a gall stone is the causative factor.

In the majority of the cases there is a long and usually intermittent history of gastric distress. In many there is a history of biliary colic, and in 15 per cent of the reported cases there was a history of jaundice.

However, if there has been previously recognized disease of the gall bladder, the early symptoms of obstruction may be misinterpreted as the pain, nausea, and vomiting from the obstruction are not unlike those of acute biliary colic.

The actual event of perforation may go unnoticed by the patient since it is frequently not accompanied by pain or discomfort.

After the stone enters the intestine it may pass spontaneously without causing symptoms, or it may lodge in some part of the tract and give rise to intermittent obstructive symptoms, which after a variable time may disappear as the stone passes per rectum, or, finally, the stone may fail to leave the small bowel and completely block it. A diameter of 25 mm. is considered the determining size as to whether a stone is liable to pass or not.

In the 150 cases reported here, the site of lodgement of the stone was given as follows:

Duodenum	6 cases
Jejunum	14 "
Proximal ileum	6 "
Middle ileum	31 "
Terminal ileum	88 "
Colon	3 "
Rectum	2 "

The higher the point of obstruction is located the more severe are the symptoms. If the stone is lodged in the duodenum or upper ileum, abdominal distention is not a prominent feature and visible peristaltic waves and intestinal patterns are rarely present.

Very rarely is a mass palpable, and abdominal tenderness and rigidity are infrequent unless perforation occurs.

The temperature and the leucocyte count are normal or slightly elevated. If obstruction is high and complete, shock and collapse rapidly occur, the outcome being fatal unless the condition is recognized and promptly relieved.

In the differential diagnosis one must consider such conditions as: (1) intestinal obstruction due to adhesions, to hernia, to intussusception, or to volvulus; (2) perforated peptic ulcer; (3) mesenteric thrombosis; (4) acute pancreatitis; (5) acute appendicitis; (6) biliary colic; (7) renal colic; and (8) abdominal metastatic infarction.

In the absence of an incarcerated or strangulated hernia in elderly persons, in whom previous abdominal surgery has not been performed, one must consider gall stones as well as malignancy as the cause of obstruction.

Roentgenological study may be of help in the diagnosis (Fig. 1). The points to be observed are: (1) air or contrast medium in the biliary system; (2) direct visualization of the stone; and (3) the x-ray evidence of intestinal obstruction.

Multiple gall stones are not infrequently encountered. When the obstructing stone is faceted it shows that there is or has been one or more other stones and a careful search should be made for them.

The treatment, of course, is the removal of the obstructing stone which is found by a careful examination of the intestinal tract from above down-

ward. The technique of the procedure is not difficult, but as the patients are usually elderly and there is customarily a prolonged delay in admitting them to the hospital the mortality is quite high, about 50 per cent. ROBERT D. MANSFIELD, M.D.

Pearson, B., and Garcia, M.: Intestinal Obstruction as a Phase of Carcinoma of the Cervix. *Surgery*, 1942, 11: 636.

Neoplastic obstruction of the intestine, though long recognized, is an apparently neglected phase of cervical carcinoma. Incidental allusions to this feature of the disease are found in the literature, but factual elaboration of the subject has seldom been attempted. Only a minority of cases suitable for operative relief reach the surgeon, and the significance of incipient low-grade obstruction seems to be generally overlooked.

In 74 squamous-cell carcinomas of the cervix which came to necropsy at Charity Hospital, at New Orleans, Louisiana, over an eleven-year period, the incidence of carcinomatous obstruction of the bowel was 12.1 per cent. Intestinal obstruction was the immediate cause of death in 6.7 per cent of this series.

A résumé of the clinical and pathological characteristics exhibited in this series shows that the cases fall into two groups. In 5 cases obstructive symptoms dominated the picture, the patients applying to obtain relief from the intestinal condition rather than for treatment of the neoplasm. The other 4 patients had been treated for carcinoma of the cervix and obstruction developed later, while they were being followed up. The 5 patients in the first group complained of intermittent colicky abdominal pain associated with nausea, vomiting, and abdominal distention.

Obstruction also develops insidiously in treated cases, with symptoms so obscure that alertness is required for its recognition. Colostomy is an effective palliative measure, and rectal involvement deserves vigorous treatment, for an occasional so-called cure may be obtained. Early detection and prompt, adequate treatment of obstructive intestinal lesions arising from carcinoma of the cervix is urged, to effect palliation and secure longer survival.

It is worth pointing out that rectal involvement does not necessarily mean that the patient's condition is hopeless. JOSEPH K. NARAT, M.D.

Hershey, J. H.: Diverticula of the Duodenum. *J. Missouri State M. Ass.*, 1942, 39: 134.

Duodenal diverticula, with or without symptoms, are found in a surprisingly large number of the population. The percentages given by different observers range from 0.5 to 16. This discrepancy may be due to technical variations in roentgenological examinations, the experience of clinicians, and the paucity of textbook information. The author classifies diverticula of the duodenum as primary sacs in which the cause is not known, and as secondary sacs which are associated with some other condition in or around the duodenum. The vast majority of these primary sacs occur in the second portion of the duodenum, a few in the third, fewer still in the fourth portion, but never in the first portion. The location is remarkably constant along the medial aspect of the second part as it curves around the head of the pancreas, or along the upper surface of the third or fourth portions.

The primary sacs are thin-walled, seldom larger than 1 or 2 cm., slightly longer than wide, and open into the lumen of the gut with a wide, narrow slit-like mouth. By invaginating a finger into the duodenum the margin of this stoma feels like a sphincter. Microscopically, the muscular coat is missing, or is much thinner than the wall of the parent gut, and the layer formed by Brunner's glands is usually absent.

The secondary sacs are found in connection with some other pathology such as duodenal ulcers, gall-bladder disease, or adhesions, which have contracted and pulled out a sac of the duodenal wall. These secondary sacs are found almost invariably in the first part of the duodenum and their walls are of the same thickness as the parent gut with the muscularis intact throughout the entire sac.

The duodenum is supplied by the superior pancreaticoduodenal artery, which passes down behind the first part of the duodenum and anastomoses with the inferior pancreaticoduodenal branch of the superior mesenteric artery. The rotations of the duodenum in the embryo with changes in the positions were, perhaps, conducive to the formation of diverticula. If a break in the resistance of the wall occurs where a small nutrient vessel enters, and, if intermittent, intraduodenal pressure is exerted over a period of years, a small protrusion along this vessel may end in a diverticulum. This is one theory.

There are either no symptoms or symptoms connected with a tentative diagnosis of gall-bladder disease, peptic ulcer, cancer, or pancreatic disease. If a sac is unable to expel barium within a few hours, under the fluoroscope, it certainly should be seriously considered as the cause of the patient's symptoms and surgery should be undertaken. The complaint is usually of upper abdominal pain, tenderness in the right upper quadrant; nausea is common and vomiting may be present to such a degree as to suggest pyloric stenosis; belching is frequent and sometimes a feeling of fullness, which may or may not be associated with eating, is present. These symptoms may be of long or short duration, the longest period observed being twenty-four years, the shortest, 3 months; often comparative freedom from attacks lasting a year or more is noted. With such symptoms a roentgen examination will settle the diagnosis.

In mild cases palliative treatment should be tried. This consists of teaching the patient to recline in such a position as to facilitate the emptying of the sac by gravity. The sac has little or no muscle in its wall; therefore it cannot empty of its own accord. Postural therapy may be effective, and often should be reinforced with some intestinal antiseptics to prevent or cure infection of the sac or its contents.

In severe cases operative procedures are indicated. The operation is relatively simple. The sac can be identified by invaginating the finger into the duodenal wall when a stoma is felt opposite the diverticular protrusion. The sac dilates like a balloon when the peritoneum has been freed. After the numerous vessels have been attended to the sac is excised, and the stump is clamped and invaginated, or the defect may be sutured as is done in any small intestinal wound. As a rule, this operation results in complete cessation of the symptoms.

The author reports the case of a woman, seventy-eight years old, who had severe pains in the right upper quadrant for three weeks, which were becoming steadily worse. Nausea and vomiting were so bad that even water could not be retained. Lumbar pains were so severe that she sat up in bed, hugged her stomach, and moaned continuously. These spells started five years ago and were started by eating, but the patient said there was no particular kind of food which upset her. Belching was common, sometimes so bad that she felt "that her stomach was going to blow up." She had never had jaundice, constipation, or diarrhea.

The tentative diagnosis was cholelithiasis, peptic ulcer, pyloric obstruction, or cancer.

Roentgen-ray examination was negative except for a diverticulum on the anterior aspect of the medial concave surface of the second portion of the duodenum. This sac showed the retention of barium after the three and the six hour plates, and was definitely tender to palpation and manipulation while being viewed fluoroscopically.

A right rectus incision was made. In the second part of the duodenum, about 1½ in. distal to the pylorus, a peculiar puckering was found. A dense network of small blood vessels lay over the sac; several of their larger branches passed into the gut near the mouth of the sac. As soon as these vessels and the peritoneal fold were dissected free, the sac ballooned out and definitely identified itself. The sac was clamped, cut free from the duodenum, and the edges of the small opening were brought together with Lembert sutures; the area was then reperitonealized and the abdomen closed in layers.

The pathological report stated that a thin-walled sac 1½ by 1 cm. was found. The mucosa was normal, but no Brunner's glands were present. The muscularis was entirely absent. Serosa also was missing because the sac had a retroperitoneal origin and had pushed up the peritoneum and this had been dissected off during the operation.

The patient recovered, was discharged twenty days postoperatively, and had no further adventitious symptoms, except some belching when she allowed herself to become constipated.

The author concludes that operation should be seriously considered if (1) a diverticulum is found in a patient who is suffering with pain in the right upper quadrant; (2) the diverticulum retains barium, and (3) the diverticulum is tender to pressure while under the fluoroscope.

MATHIAS J. SEIFERT, M.D.

Warren, R., and Miller, R. H.: Regional Enteritis. *New England J. Med.*, 1942, 226: 589.

Warren and Miller report on 43 cases of regional enteritis which were treated in the Massachusetts General Hospital from 1930 to 1940, inclusive. At the time of admission each case could be classified as being in one of the five clinical stages of the disease; 6 cases were acute, 15 were diarrheal, 13 were obstructive, 4 were fistulous, and 5 were symptomless. The average age of this group of 43 patients was thirty years. In 27 cases the terminal ileum alone was involved; in 10 cases the terminal ileum and the cecum were the site of the lesion; and in 6 cases other areas of the small bowel were involved. Diagnosis was made either by pathological examination, gross observation at the operating table, or by x-ray study. The typical pathological picture of regional enteritis is that of a chronic granulomatous process in the intestinal wall and mesentery.

The form of treatment that has been almost universally advocated has been surgical resection in all cases of the disease that are well established, but conservative therapy should be instituted in the early acute cases. At operation three important principles must be kept in mind; resection of the diseased area, a wide margin of normal intestine being left; search for and removal of "skip" areas; and wide resection of the involved mesentery and lymph nodes.

Resection offers a certain percentage of cures, and should be advocated when an established case is first recognized as such. Conservative treatment should be followed in early cases. The ideal form of treatment of the disease cannot be decided upon until the etiological agent is discovered.

EARL GARSIDE, M.D.

Rogers, H., and Faxon, H. H.: A Statistical Study of 671 Cases of Appendical Peritonitis. *N. England J. M.*, 1942, 226: 707.

Between 1929 and 1940, 5,055 cases of appendicitis were treated at the Massachusetts Hospital with a gross mortality rate of 2.04 per cent. In those without perforation the mortality was only 0.37 per cent, while in those cases with perforation and an associated peritonitis it was 12.97 per cent. Recent progress in chemotherapy, surgical bacteriology, blood chemistry, and intestinal intubation probably partially, at least, explains the drop from a mortality of 25 per cent in 1929 to that of 6 per cent in 1939 in the cases of appendical peritonitis.

Only those cases which were proved to be peritonitis resulting from appendicitis are included in the analysis. These cases have been grouped, according to whether or not a palpable mass was described preoperatively. This method of classification serves to separate the cases into two groups: those in which localization has already occurred, and those in which localization has not and probably will not take place.

Of the cases under discussion, 444 represented the group of appendical peritonitis without a palpable mass. Sixty-five per cent were males with a mortality of 14.2 per cent, as compared to a mortality

of 19 per cent in females. The age incidence and mortality decades showed the mortality to be lowest among young adults in whom the incidence was highest, and highest among patients in the extremes of life in whom appendicitis is less common. The policy of therapy offered these patients varied. In 1929, 100 per cent of them were operated upon immediately, while in 1937 only 74 per cent were subjected to early operation.

The prognostic significance of facts to be obtained from the clinical study of these patients has been summarized in the following table:

TABLE I.—RELATIVE PROGNOSTIC VALUE OF VARIOUS CLINICAL FACTORS AS DETERMINED BY THE MORTALITY RATE ASSOCIATED WITH EACH FACTOR, BASED ON 444 CASES WITH A TOTAL MORTALITY OF 15.9 PER CENT

Clinical factor	Mortality with factor present per cent	Mortality with factor absent per cent
Story of "acute perforation" in very ill patient	42	7
Patient very ill on admission	34	7
Peristalsis definitely absent	28	9
Wrong preoperative diagnosis	33	15
Age over sixty years	32	15
Peristalsis not definitely present	23	7
Leucocyte-pulse index above 6	21	6
Story of "acute perforation"	25	13
Abdominal spasm, diffuse	21	10
Operation not on first day of disease	18	7
Age below ten or above sixty years	24	13
Abdominal spasm present	16	6
Rectal tenderness absent	21	13
Story of preoperative chills	22	15
Age under ten years	20	15
Female sex	19	14
First attack of appendicitis	13	11

All of the above factors with the possible exception of the leucocyte-pulse index are self explanatory. This index is derived by dividing the thousands of leucocytes into the pulse rate. It was found that this averaged 6 for the survivors and above 6 for the fatalities.

The factors in the table presented are arranged in the order of their prognostic significance. In that the contrasted groups could not be identical in all respects, these figures refer only to the particular factor under consideration. The authors believe that when several of the most unfavorable factors are combined in any one case the patient must be recognized as an extremely bad risk.

The analysis includes several other factors. Immediate operation was performed on 91.9 per cent of the cases and on 84 per cent of the very ill with a mortality of 14 per cent. In a small group treated expectantly, two-thirds of whom were very ill, the mortality was 39 per cent. However, with the decrease in the frequency of early operation which occurred over a period of years the total mortality has shown a decided drop. This improvement in the mortality statistics is partly attributed to an increasing value of accurate individualization. Regarding the type of operation it was found that the care and skill of the surgeon was of more significance than the type of the incision. When the presence of peritonitis is in doubt, two incisions are safer than one disastrously wrong one. No deaths could be definitely attributed to the anesthetic. The correct choice of anesthetic will depend very much on several factors, such as the skill of the anesthetist, the skill of the surgeon, and the condition of the patient. It was found that speed in operating was not a prime factor. It is more important to avoid unnecessary trauma, but if in doing this the appendix cannot be removed in one hour, it should not be removed by that surgeon at that operation. Drains were used in 96 per cent of the 433 operative cases. On the basis of these experiences it was concluded that properly placed drains do little or no harm and that there is no evidence which would justify omitting them in cases of gross appendical peritonitis merely as a matter of policy.

The complications and their frequency of occurrence are summarized in the following table:

TABLE II.—COMPLICATIONS AND THEIR FREQUENCY

Complication	No. cases
Residual abscesses following appendectomy (5 drained; 35 undrained)	40
Nonfatal pneumonia	4
Pneumonia in 8 cases of fatal peritonitis	8
Pulmonary infarcts	2
Pulmonary collapse	10
Major wound sepsis	24
Fecal fistula	3
Incisional hernias	2
Intestinal obstruction	9
Phlebitis	2
Nonfatal phlebitis, urinary fistula, empyema, herpes zoster, and pulmonary embolism (1 case each)	1

Forty-nine, or 70 per cent, of the deaths were caused by general peritonitis with or without concomitant complications. Six deaths resulted from pneumonia. Other causes of death were phlebitis (3), pulmonary embolism (3), sepsis, subphrenic abscess, gas gangrene, uremia, acute nephritis, dilatation of the right side of the heart, myocardial failure, and acute respiratory failure (1 each). There were 2 deaths of which the causes were not determined.

Factors which might have contributed to the deaths and which might have been avoided are given as follows: errors in diagnosis, wrong choice of treatment, prolonged surgery, and errors in technique. There were 14 deaths which are considered unavoidable.

The following conclusions are suggested:

Patients who look acutely ill on admission and are operated on more than six hours after an incidence interpreted as acute perforation suffer the highest mortality.

A leucocyte-pulse index over 6 is a bad prognostic sign.

The fourth and fifth days are the most dangerous for appendectomy.

For incision and drainage alone the McBurney incision is more than twice as safe as a medial type. For appendectomy the type of incision is of less consequence than the amount of trauma done through it.

About half the residual abscesses following appendectomy regress spontaneously.

The proper use of a cigarette drain is satisfactory and safe.

When the diagnosis is in doubt and the contemplated treatment is incompatible with recovery from acute appendical peritonitis, a fatality may sometimes be avoided by a preliminary gentle exploration through a small McBurney incision.

ALFRED B. LONGACRE, M.D.

Kallet, H. I.: The Use of Alloy Steel Wire in Anal-Sphincter Repair. *Harper Hosp. Bull.*, 1942, 1: 103.

Anal incontinence following accident or surgery is a most distressing complication. Although many techniques for repair of the injured muscles have been developed, none has been wholly satisfactory. The chief difficulty has been the occurrence of infection with sloughing of the suture material and disruption of the wound. Following Smiley's report on the use of alloy steel sutures to unite the separated muscle ends, Kallet has employed these sutures in 3 cases with gratifying results. The surgical technique, postoperative care, and 3 case reports are given in substance.

NOAH D. FABRICANT, M.D.

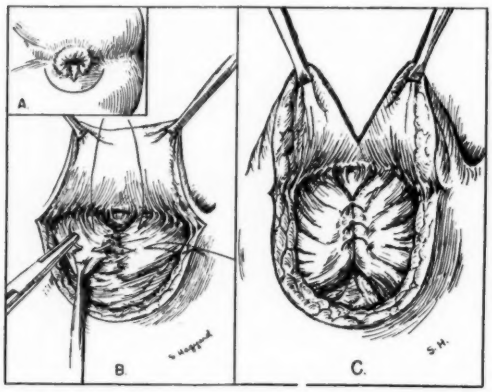

Fig. 1. A. A semilunar incision is carried well beyond the scar. B. A flap is dissected up; the healthy muscle is exposed and sutured with alloy steel wire. C. The muscle is folded over and the dead space eliminated as the sutures are tied. A wedge is taken out of the flap to prevent redundancy.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Nadler, S. B., and Butler, M. F.: The Cephalin-Cholesterol Flocculation Test in the Jaundiced Patient. *Surgery*, 1942, 11: 732.

The cephalin flocculation test was done on the sera obtained from 50 jaundiced patients. A definite difference in flocculation reaction was observed in cases of jaundice caused by obstruction of the extrahepatic biliary tract and in cases of jaundice with hepatitis but without demonstrable obstruction of the extrahepatic duct. Cases of jaundice caused by obstruction in the extrahepatic ducts give either negative or faintly positive reactions, while those due to hepatitis give strongly positive reactions.

The test is therefore of diagnostic value in the differential diagnosis of obstructive jaundice and jaundice caused by hepatitis.

SAMUEL KAHN, M.D.

Golob, M., and Kantor, J. L.: Two Cases of Double Gall Bladder. *Am. J. Digest. Dis.*, 1942, 9: 120.

Two cases of double gall bladder are presented in order to point out that this condition may confuse the clinical picture of gall-bladder disease. In both cases double gall bladders were detected in routine roentgenographic studies although no symptoms referable to gall-bladder disease were elicited. In the first case one of the gall bladders contained stones.

It is pointed out that if the condition is not proved by cholecystography the accessory gall bladder may be overlooked at operation. If the accessory organ is diseased the results may be serious. It is possible that the gall bladder lying in the normal site may be found to be normal at operation while the accessory gall bladder may be the seat of trouble.

If cholecystography is performed it should be borne in mind that since a diseased gall bladder may coexist with a normal accessory gall bladder the former may not be visualized, while the latter would reveal a normal sequence. This finding may lead to a wrong negative diagnosis with the result that an unsuspected active lesion might be overlooked.

HAROLD LAUFMAN, M.D.

Finney, G. G., and Owen, J. K.: The Surgical Aspect of Congenital Absence of the Gall Bladder. *Ann. Surg.*, 1942, 115: 736.

Based upon their separate experiences, each with 1 case of congenital absence of the gall bladder in an adult, the authors believe that this condition is not quite as rare as it is usually considered to be.

They report the 2 cases in detail, together with 46 similar cases collected from the literature. Only those cases in which no other pathological lesion was associated, such as complete or partial absence of the biliary ducts, were considered.

As early as the second week of fetal life, the hepatic diverticulum develops a ventrocaudal extension, the cavity of which is soon obliterated by epithelial-cell proliferation. The extension from which

the gall bladder develops remains connected with the diverticulum by a pedicle, from which the cystic duct develops later. The hepatic duct develops from the cranial portion of the diverticulum, and the common duct develops from the caudal portion. The common bile duct reopens during the fourth week of fetal life and the hepatic duct opens during the fifth week. Some time during the sixth week the cavity of the gall bladder reopens. It is impossible to determine at the operating table whether the absence of a certain portion of the biliary tree is due to agenesia or atresia. It is also impossible to determine which factor may have affected the gall bladder, which represents a terminal extension and, therefore, may never have existed at all. However, if the terminal portion is present, the absence of an intermediate portion can be due only to atresia.

In 11 reported cases, calculi were found in the common duct. In 10 of these the common duct was dilated; it was of normal size in 1.

In this condition, which is twice as common in women as in men, the gall bladder fossa may be absent and the quadrate lobe may be indefinite in outline. The symptoms are those of gaseous indigestion, intolerance of fatty foods, and sometimes episodes of sharp, lancinating pain in the right upper quadrant which radiates to the right scapula. Occasionally, jaundice is present. In the cases reported, the diagnosis had not been made preoperatively.

When abdominal exploration is carried out for suspected gall-bladder disease and the gall bladder is not found, the possibility of an intrahepatic gall bladder, as well as the presence of calculi in the biliary ducts, should be considered. If no stones are found after a thorough exploration, one is justified in making a reasonable attempt to locate an intrahepatic gall bladder.

Several interesting drawings of the operative findings in the authors' 2 cases are included.

ROBERT D. MANSFIELD, M.D.

Womack, N. A., and Bricker, E. M.: The Pathogenesis of Cholecystitis. *Arch. Surg.*, 1942, 44: 658.

Womack and Bricker review the outstanding features of cholecystitis, one of the most common of the inflammatory conditions met in the abdomen. It is more prevalent in females than in males, and in persons of sthenic and hypersthenic habitus particularly (metabolic factor?). Children and young adults seldom have the disease, but the incidence increases with advancing age. No definite relationship to ulcerative conditions in the gastrointestinal tract can be made out. However, there is a definite relationship between cholecystitis and cholelithiasis, for the latter is seldom encountered in the absence of the former. Stones in the gall bladder sooner or later may be concerned with partial or complete obstruction of the cystic duct.

The pathological picture in cholecystitis is unique in many respects. Gangrene is common without concomitant arterial obstruction. This is highly suggestive of a direct action of some substance which produces necrobiosis of the tissue. Acute inflammation of the organ is associated (1) usually with gross or microscopic evidence of a pre-existing inflammatory process, (2) with increased vascular permeability—edema, extravasation, and injury to the tissues (necrotic areas), and (3) nearly always with obstruction to the cystic duct (over 90 per cent of the cases). Lipids (cholesterol) may incite mild inflammation. Evidence of a deposition of bile or some of its components in the gall-bladder wall may occasionally be seen in cases of chronic cholecystitis.

From a consideration of these features it would seem that any causative agent able to effect such a pathological syndrome as that seen in cholecystitis must have (1) the ability to produce a particular injury to tissue, (2) easy access to the gall bladder, and (3) increase of its action in the presence of obstruction of the cystic duct. The authors believed that bile might fulfill these qualifications, and studied it with the idea that it might be a causative factor in the production or instigation of cholecystitis. Dogs were used in the experiments. They found that the action of bile on tissues is direct and is dependent chiefly on the concentration of cholic-acid derivatives. With the injection of bile into the tissues the reaction consists of gangrene, edema, ecchymosis, round-cell infiltration, and fibrosis, this reaction being modified later on by secondary bacterial invasion. If complete obstruction of the cystic duct is effected and the imprisoned bile is then replaced with a physiological solution of sodium chloride, inflammation of the gall bladder is not produced. Occlusion produces only distention with mucus unless it is associated with severe bacterial infection, when true empyema may supervene. When the cystic duct is occluded and the bile is left in the gall bladder, various degrees of inflammatory reactions are obtained. This inflammation is identical with that encountered in clinical cholecystitis. The severity and type are dependent on the content and concentration of the bile obstructed. The experiments show that this inflammation is produced by the direct action of bile on tissue. Bile and its components (especially cholesterol) can be demonstrated at times in the wall of the gall bladder in cases of human cholecystitis.

Bacterial infection is a variable factor in cholecystitis, and while it may be of great clinical importance, the authors believe that from the standpoint of pathogenesis it should be considered as a complication that results when contaminated tissue is injured.

The article contains many photomicrographs of gall-bladder-wall sections from the experimental animals used.

EDWIN J. PULASKI, M.D.

Rubenstein, A. D.: Unrecognized Typhoid Cholecystitis as a Source of Hospital Infections. *N. England J. M.*, 1942, 226: 722.

Two cases of typhoid fever that occurred among the personnel on the surgical wards of two different hospitals are presented. The epidemiological in-

vestigation of the first case revealed a previously unrecognized typhoid carrier as the source of infection. The carrier had been admitted for operation with a diagnosis of chronic cholecystitis and cholelithiasis. The epidemiological investigation of the second case revealed as the source of infection a missed case of typhoid fever admitted to the hospital for a complicating acute cholecystitis; this primary case was in turn traced to a chronic carrier, the ultimate source.

Protection of hospital personnel by routine antityphoid inoculation is an essential preventive measure in all hospitals.

When cases with gall-bladder disease are admitted to hospitals for operative procedures, careful histories should be obtained regarding previous typhoid fever. In cases presenting such a history, laboratory studies should be instituted to rule out the typhoid-carrier state.

The possibility of typhoid etiology should be considered in all cases of chronic cholecystitis. Acute cholecystitis may in rare cases be the most outstanding clinical manifestation of typhoid fever.

MANUEL E. LICHTENSTEIN, M.D.

McLanahan, S., Trout, H., Jr., and Weary, W.: Acute Cholecystitis. A Review of 140 Cases. *Am. J. Surg.*, 1942, 56: 432.

The records of 140 patients suffering from acute cholecystitis who were operated upon at the Union Memorial Hospital in Albany, New York, during the period of from September, 1923, to November, 1940, were reviewed.

Acute cholecystitis is a disease of middle and late middle life. In the cases reviewed, age had a very definite effect on the mortality, the rate for patients under sixty years of age being 2.8 per cent, and for those over sixty years, 26.5 per cent. Females were affected far more often than males.

Pain, nausea, and vomiting were almost universal symptoms. The palpation of a mass was uncertain, since muscle spasm or other structures were confusing to the examiner. Twenty per cent of the patients were jaundiced, yet the common duct was explored only 5 times, which indicated a conservative policy toward this procedure.

About one-half of the patients had symptoms for more than a week before their admission to the hospital. A striking fact was the high mortality (18 per cent) which occurred in the group operated upon within the first twenty-four hours; however, these were the patients who were most ill. From the second to the sixth day following operation, there were no deaths. This indicates the necessity for proper preoperative preparation of the patient, such as a restoration of the biochemical balance, sedation, and rest. The patient whose symptoms persist or subside slowly, should be operated upon promptly to arrest any progressive pathological change. The patient whose symptoms have rapidly diminished should be given further diagnostic study and operated upon later to avoid recurrent attacks.

Ten per cent of the total number of cases showed perforation, with a mortality of 42.8 per cent, and 29.2 per cent of the cases showed gangrene, with a mortality of 17.5 per cent. The advantage of cholecystectomy over cholecystostomy is generally admitted. If the gall bladder is removed from above downward, the ducts can usually be safely identified. The patients subjected to cholecystostomy were either extremely ill or they had complications. The mortality following cholecystostomy in this series was 25 per cent; for cholecystectomy, 4.5 per cent. The great technical difficulties inherent in the secondary removal of a previously drained gall bladder must be borne in mind.

In this group of patients, 31 per cent developed some postoperative complication, such as pneumonia, atelectasis, pulmonary infarction, cardiac failure, peritonitis, hemorrhage, shock, intestinal obstruction, phlebitis, evisceration, prolonged drainage, and wound infection. Use of the sulfonamides will undoubtedly prove helpful in combating many of these complications. The mortality rate for the entire group was 8.6 per cent. There were no cases of "liver death."

S. LLOYD TEITELMAN, M.D.

Gans, H. M.: Choledocholithiasis. A Clinical Study of 109 Patients Operated Upon. *Am. J. Surg.*, 1942, 56: 423.

The author discusses the pathological physiology of the common bile duct, and presents the results of a statistical analysis.

In the five-year period from 1936 through 1940, 586 patients were operated upon at the Mt. Sinai Hospital, Cleveland, for biliary-tract disease. In 109 of these cases, exploration of the common duct was performed. Stones were found in 53 cases, and debris in 12 cases. The age of the patients varied between thirty and seventy years.

In a study of the symptoms, interest was directed chiefly toward those pointing to involvement of the extrahepatic biliary ducts, namely, vomiting, jaundice, chills, and fever. In the cases in which definite stones were present in the common duct, the incidence of vomiting was 90 per cent; chills and fever were present in 62 per cent, and jaundice was found in 75 per cent. In the cases in which only debris was found, there was a higher incidence of jaundice, while in the cases in which there were no pathological findings in the common duct, the incidence of vomiting was somewhat less, and the incidence of chills and fever and jaundice was much less (27 per cent and 42 per cent, respectively). Postoperative hemorrhage occurred in 6 of the patients, prior to the use of Vitamin K.

The value of choledochography is emphasized and its routine postoperative use is adivsed. Cases of spasm of the sphincter and their response to drugs, narrowing of the duct due to pancreatitis, and stones overlooked at operation can be studied. In 4 cases in which an overlooked stone was discovered, the author was successful in accomplishing fragmentation and expulsion of the stone by intraductal in-

stillation of ether and oil and the use of amyl nitrite by inhalation.

In this series it was necessary to perform secondary operations on the common duct on 26 patients. These cases were subdivided into 4 groups: (1) those in which there had been an error in judgment, in which common-duct exploration was indicated and not done; (2) those in which there had been an error of technique, in which stones were left over; (3) cases in which operation was unavoidable, in which the condition of the patient did not permit ductal exploration; and (4) cases with a recurrent formation of stones due to persistent infection in the common duct.

In the 586 patients operated upon for biliary-tract disease, the mortality rate was 4.6 per cent, while, in the 109 patients in whom the common duct was explored, the mortality rate was 15.6 per cent. It was believed that the increased mortality was not due to the operative procedure, but to the long-continued infection in the biliary tract with associated damage to the liver parenchyma, the age of patients, and advanced cardiovascular disease.

S. Lloyd Teitelman, M.D.

Lehman, E. P.: Annular Pancreas as a Clinical Problem. *Ann. Surg.*, 1942, 115: 574.

Annular pancreas is an anatomical anomaly of great rarity. The reports of only 48 cases have been found in the anatomical, pathological, and surgical literature, and of these only 10 have been operated upon. In no previous case has the diagnosis been suggested preoperatively and there is no agreement on surgical treatment. The present report deals with a single treated case with a correct tentative preoperative diagnosis.

The patient was a man of twenty-three years who had had a number of attacks, occurring with irregular frequency, of agonizingly severe, sharply limited nonradiating epigastric pain. Only one attack, that just preceding admission to the hospital, was associated with vomiting. On roentgenographic examination following a barium meal, a smooth filling defect was noted in the right aspect of the second portion of the duodenum, thought by the roentgenologist to be a benign polyp. There was also low-grade obstruction at the ligament of Treitz. However, on account of the smooth contour of the defect, the surgeon suggested the diagnosis of annular pancreas.

At operation the following was noted:

The dilated first portion of the duodenum was readily identified and the duodenum was mobilized by an incision in the peritoneum at the outer side. Palpation of the pancreas then revealed a diffuse nodular enlargement of the organ. In the head of the pancreas the nodules were large and hard and suggested malignancy. The tail of the pancreas was also indurated and enlarged so that its cross-section was nearly circular. Further search was made in the region of the obstruction and the diagnosis of annular pancreas substantiated. In the lowest part of the second portion of the duodenum there could be seen what was apparently pancreatic tissue in a band stretching across the duodenum. On the superior surface this band was about 3 cm. in diameter and narrowed to about 1.5 cm. in diameter at the under surface where it disappeared beneath the duodenum. Superficially it appeared thin but after dissection it proved to be about 1 cm. in thickness. A plane of cleavage between this structure and the duodenum was found and it was then divided. Immediately the duodenum unfolded to an extent of about 4 cm., with apparently complete relief of the obstruction. About 1 cm. of the anterior portion of the ring was further dissected off the duodenum and removed for biopsy. The cut ends of the pancreatic ring were closed with mattress sutures of fine silk. The duodenum was then dropped back in place.

The operative findings are well illustrated.

Pathological examination of the specimen of pancreas removed showed atrophic pancreatic tissue with long-standing subacute inflammation.

The author discusses the anatomy, embryology, pathology, and clinical picture of annular pancreas.

This disease will probably remain difficult to diagnose roentgenologically and to be easily missed on exploration. It is safe to affirm, however, that the syndrome of chronic duodenal ileus, supplemented by corroborative roentgenographic evidence of obstruction with a smooth niche constricting the second portion of the duodenum from its dextral aspect, should make possible, at times, a correct preoperative diagnosis. It must be remembered that chronic stenosing ulcer of the descending portion of the duodenum may present roentgenographic appearances indistinguishable from the outline described. Certainly, when operating for chronic duodenal ileus, the surgeon should thoroughly expose the anterior and lateral surfaces of the duodenum as far distally as the beginning of the third portion, mobilizing the transverse colon if necessary.

Two methods of treatment may be considered: first, indirect methods such as gastroenterostomy or duodenojejunostomy, and, second, direct methods such as division or partial resection of the ring with or without a plastic procedure upon the constricted lumen. Of these, all but duodenojejunostomy have been employed on treated cases.

The author summarizes the available therapeutic data as follows: "There has been only one cure following gastro-enterostomy alone, in a case in which the obstruction was not primarily due to annular pancreas, and one cure following gastro-enterostomy combined with duodenorrhaphy. Of four direct attacks on the ring, three were followed by complete cure and one by indefinite persistent symptoms. The score is apparently slightly in favor of the division of the ring but the figures are too meager to warrant a positive opinion. One can at least state, on the credit side, that attack on the ring seems logical and that it has not resulted fatally and has effected more cures than failures. On the debit side, the danger of fistula is present."

Therefore he seems to feel that there is justification for tentative advocation of the following operative procedures: (1) exposure of the annula and careful dissection to separate it from the duodenum; (2) division of the ring as far to the left anteriorly as possible; (3) resection of a sufficient portion of the ring toward the right and posteriorly to ensure adequate release of the duodenum; (4) if there is not complete expansion of the constricted bowel, longitudinal incision of the stricture with transverse closure; (5) ligation of presenting ducts in the cut surfaces of the pancreatic ring, followed by careful closure with interrupted sutures of fine silk, and (6) closure of the abdomen without drainage.

SAMUEL H. KLEIN, M.D.

Necheles, H., Plotke, F., and Meyer, J.: Studies on Old Age. Active Pancreatic Secretion in the Aged. *Am. J. Digest. Dis.*, 1942, 1: 157.

The pancreatic secretion of a group of 30 aged subjects with an average age of sixty-six and one-half years was compared with that of a group of 30 young persons with an average age of twenty-three and four-tenths years. Pancreatic secretion was stimulated by the intraduodenal injection of oleic acid. The following results were obtained:

The bicarbonate and amylase content was significantly increased in the older group. Lipase was 21 per cent lower in the aged subjects. The volume of fluid and trypsin concentration was not significantly different in both groups.

From this work, the authors make certain tentative statements about digestion and nutrition in the aged.

In old people the diminished volume and amylase content of stimulated salivary secretion certainly will impair the first phase of starch digestion following its ingestion.

The slightly increased content of amylase in the duodenal juice following stimulation of the pancreas will make up somewhat for the deficiency of the amylase in the saliva. The low volume of stimulated salivary secretion in old people and the dryness of the mouth resulting therefrom, may, however, induce these persons to drink more fluids with their meals. The authors have made no such observations, but if this is true, a factor of dilution will have to be considered in addition. Examination of the feces of old people on diets containing varying amounts of starch may further elucidate this question.

The significant lowering of lipase secretion by the pancreas suggests that the fat content in the diet of old persons should not be too high.

SAMUEL H. KLEIN, M.D.

Russum, B. C., and Carp, O.: Carcinoma of the Body and Tail of the Pancreas. A Clinical and Pathological Entity. *Am. J. Surg.*, 1942, 56: 414.

The frequency of carcinoma of the body and tail of the pancreas is not appreciated, either in teaching or in medical writing. The fact that it is about one-third as frequent as carcinoma of the head of the pancreas entitles it to greater emphasis in the differential diagnosis of pancreatic malignancy.

In a review of 3,500 autopsies, 8 cases of carcinoma of the body and tail of the pancreas were encountered. Six of the 8 cases were in men, and the average age of the patients was fifty-three and seven-tenths years.

The clinical features of the disease are (1) upper abdominal pain which may be epigastric or in either upper quadrant, radiating to the left back, chest, or scapulae, often paroxysmal or deep and boring; (2) rapid loss of weight and strength; (3) absence of jaundice or jaundice developing late in the disease; (4) the absence of positive findings of specific lesions of other abdominal viscera; (5) confusing symptoms such as constipation, hematemesis, melena, distended abdominal veins, enlarged liver or spleen, and ascites; and (6) the presence of a mass in the midepigastrium or either upper quadrant.

Cases of carcinoma of the body and tail of the pancreas are characterized by massive metastases, while this is not true of carcinoma of the head. This is probably due to the anatomical relations of the body and tail, which make penetration of the transverse colon, stomach, diaphragm, or direct growth into tributaries of the portal vein quite easy. These widespread metastases explain the clinical picture and the occasional misleading symptoms. These facts indicate that a radical resection of the head of the pancreas, in contradistinction to the body and tail, may offer some hope of a permanent cure.

The 8 case histories are summarized.

S. LLOYD TEITELMAN, M.D.

Elman, R.: The Surgical Aspects of Acute Pancreatitis. *J. Am. M. Ass.*, 1942, 118: 1265.

Acute pancreatitis, far from rare in its common form, often subsides spontaneously. This Max Ballin Lecturer makes the point that the supposed rarity of this disease is due to the fact that it is nearly always unrecognized because it mimics other well known conditions, both surgical and medical. The usual tentative surgical diagnoses are: perforated peptic ulcer, acute cholecystitis, intestinal strangulation, or acute appendicitis. It may also simulate acute coronary disease, biliary colic, or, occasionally, tabetic crises. If biliary colic is suspected, the diagnosis of cholecystitis is often confirmed and is followed by cholecystectomy. The diagnostic error is suggested, at times, when the patient returns with recurrent attacks of a similar nature occurring within a few weeks or months after operation.

A simplified method of determining serum amylase enabled the author to do routine estimations of the blood amylase on all patients entering both the Barnes and St. Louis City Hospitals, in St. Louis, for emergency treatment of acute pain in the upper part of the abdomen. As a result of these serum-amylase determinations at Barnes Hospital, the number of diagnoses of acute pancreatitis has increased by several hundred per cent. At the St.

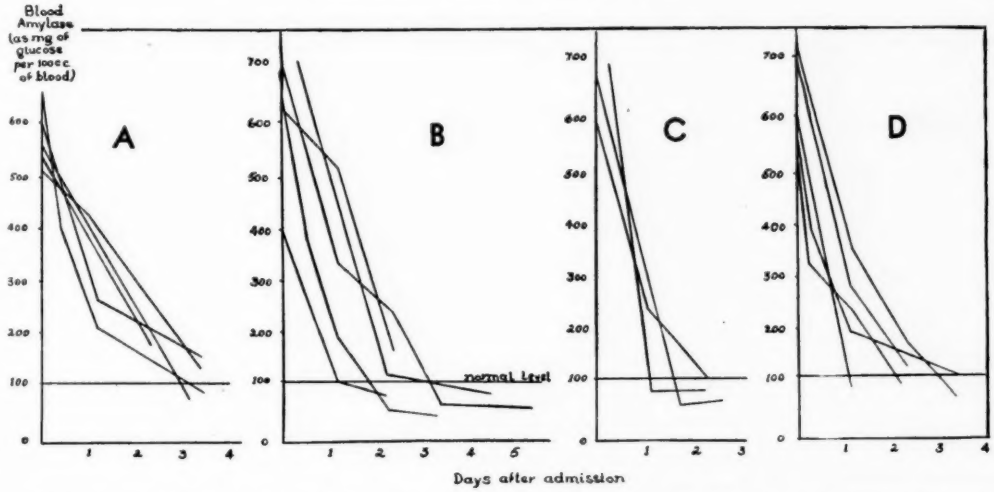

Fig. 1. Days after admission. Characteristic serum-amylase curves in four groups of patients with acute interstitial pancreatitis: A, with normal gall bladder; B, with pathological gall bladder; C, following cholecystectomy; D, with condition of gall bladder unknown.

Louis City Hospital 65 cases were recognized during the past five years. The incidence of acute pancreatitis, at the latter institution, was about one-half that of perforated peptic ulcer and one-tenth that of acute appendicitis.

The curve of amylase is usually a characteristic one, high at the beginning of the attack but falling very rapidly to normal. This is true particularly when the attack is relatively mild; in these instances the elevation of serum amylase may be only of from twelve to twenty-four hours' duration.

The diagnosis of acute pancreatitis having been made, it must then be decided whether the patient is suffering from acute nonhemorrhagic pancreatitis or whether the lesion is a true necrosis of the pancreas. This is done by observation because operation is not urgent.

If the case is one of acute nonhemorrhagic pancreatitis, the attack will subside promptly. In the latter case, the attack will not subside, and prolonged nonoperative therapy may end in a fatality.

The treatment suggested is as follows:

1. Necrosis of the pancreas demands operation, following, perhaps, several days of adequate preparation of the patient. The lesser peritoneal sac is opened and drained. Cholecystostomy is advisable in these patients, to divert the flow of bile which seems to be a factor in the development of pancreatitis, by reflux into the pancreatic duct. A fall in the blood amylase in these patients is due, not to a subsidence of the inflammatory process, but rather to a destruction of the gland which manufactures amylase.

2. When acute nonhemorrhagic pancreatitis subsides, both a complete gastrointestinal series and a cholecystogram are done. Cholecystectomy is done if indicated; removal of a diseased gall bladder and of stones will sometimes afford complete relief. There are, however, 3 other possibilities: (a) cholecystectomy followed by a recurrence of the pancreatitis, (b) previous cholecystectomy, followed by recurrent attacks of pain, which for the first time are shown to be due to acute pancreatitis, and (c) repeated attacks of acute pancreatitis with no evidence of a surgical lesion for which an abdominal operation is indicated. The problem of therapy in these cases is helped by a natural tendency of the attacks to stop eventually.

Of the drugs to be used, morphine, ephedrine, and epinephrine are not as satisfactory as glyceryl trinitrate—1/100 gr. (0.0006 Gm.) to be placed under the tongue and this repeated in a few minutes shortly after the onset of the attack. This remedy must be used properly; it fails to relieve pain if the attack has been present a number of hours. A regimen of frequent small feedings, and the avoidance of any large meals, followed by necessarily long periods without the ingestion of food, maintain a more or less constant flow of bile and avoid any storage of bile in the gall bladder for long periods of time. Many patients may enjoy long remissions in this way.

The author asks that a blood-amylase determination be made early in all cases of unexplained jaundice. If a pancreatic tumor were obstructing the pancreatic duct, the rise in blood amylase would be prompt; however, with complete obstruction, a return to normal occurs in a few weeks. In nearly all late cases of carcinoma of the head of the pancreas which were studied, the blood amylase was normal or below normal. EUGENE J. AUDI, M.D.

MISCELLANEOUS

Vesper, J. A.: Peritoneoscopy, An Additional Diagnostic Method. *Kentucky M. J.*, 1942, 40: 169.

Peritoneoscopy is a valuable addition to the diagnostic armamentarium. It is useful when one wishes (1) to make or confirm a diagnosis; (2) to avoid laparotomy by determining beforehand when it should not be done; (3) to plan treatment; (4) to study the progress of a disease such as tuberculous peritonitis; (5) to study the physiological functions of the organs at first hand and their reactions to the effects of drugs and trauma; and (6) to inject oxygen for tuberculous peritonitis, divide peritoneal adhesions, and aspirate cysts and liver abscesses.

Preoperatively, the bowel is decompressed by means of enemas and pitressin; catheterization is then done and the patient receives morphine, hyoscine, and cactin hypodermically, which, with a barbiturate, keeps him comfortable. The abdominal wall is prepared as for any surgical procedure. Local infiltration anesthesia is used.

A small stab incision is carried through the skin and fascia, and a pneumoperitoneum needle is inserted into the abdominal cavity and swung in a circle to determine the presence of loops of bowel or adhesions. The abdomen is distended with air and the sheath with an obturator replaces the pneumoperitoneum trocar. At this stage any ascites present is removed by suction. The telescope is then inserted into the sheath and the examination is made. Further air is added from time to time, as needed, with a rubber bulb attached to the instrument.

During the examination one is able to visualize the parietal peritoneum, the omentum, the upper surfaces of the liver together with a small portion of the under surface and the edges, the gall bladder, the anterior surface and greater curvature of the stomach, and the gastrointestinal tract, including the colon. With the patient in the Trendelenburg position one may see the dome and posterior surface of the bladder, the uterus, the fallopian tubes, and the ovaries.

The dangers to be avoided are: (1) perforation of the intestine; (2) hemorrhage; (3) infection of the peritoneum; and (4) air embolism from the pneumoperitoneum.

The contraindications to the procedure are: (1) cardiac and pulmonary conditions in which an additional limitation of vital capacity would prove dangerous; (2) an abdomen frozen by adhesions; and (3) intestinal obstruction. There is some question as to whether the method should be used in acute inflammatory conditions.

The conditions in which the procedure has proved its worth include: (1) tuberculous peritonitis; (2) the presence of questionable abdominal masses; (3) ascites of undetermined origin; (4) malignancy of the gastrointestinal tract; (5) pelvic disease and its sequelae; and (6) abdominal trauma, as an aid to endocrinology; it is also valuable in the differential diagnosis of jaundice.

The mortality (1 per cent) is extremely low.

It was brought out in the discussion of the article that when a peritoneoscope is not available, a foreoblique cystoscope may very well be adapted for the same purpose. ROBERT D. MANSFIELD, M.D.

Karabin, J. E.: Retroperitoneal Hemorrhage, with Special Reference to the Accompanying Paralytic Ileus. *Am. J. Surg.*, 1942, 56: 471.

Nine cases of retroperitoneal hemorrhage are reported. One hemorrhage occurred after an appendectomy, another after a vaginal hysterectomy, and 7 occurred as a result of ruptured abdominal aortic aneurysm.

Retroperitoneal hemorrhage may be classified into hemorrhage due to nontraumatic and traumatic causes as follows:

Traumatic	Nontraumatic
a. Nonoperative	a. Diseases of the blood vessels which are anatomically retroperitoneal: aneurysm, spontaneous rupture of the blood vessels associated with arteriosclerosis or hypertension.
1. Direct injury to muscle, kidney, blood vessel, or other tissue situated retroperitoneally.	b. Diseases of the blood: leucemia and hemophilia most common.
2. Fractures of the ribs, vertebrae, or pelvis.	c. Diseases of the kidney: nephritis, hydronephrosis, calculi, cysts, and neoplasms.
b. Operative	d. Diseases of the retroperitoneal tissues: infections, neoplasms, or embolic or thrombotic phenomena.
1. Secondary to any operative procedure related to the retroperitoneal tissues.	e. No demonstrable cause: spontaneous hematoma unassociated with any demonstrable pathological condition.

The signs and symptoms are quite similar in both groups but may vary with the underlying cause of the hemorrhage. The treatment of the retroperitoneal hemorrhage will depend upon the etiology of the condition.

At the onset of the hemorrhage there is an abdominal syndrome simulating a generalized peritonitis which is due to a reflex, most likely from an irritation of the sympathetic and parasympathetic nervous systems.

After this acute stage, a paralytic ileus usually develops. The ileus may occur from twenty-four hours to five days after the onset of the hemorrhage. It is probably due to a paralysis of the sympathetic and parasympathetic systems, rather than a reflex irritation of the splanchnic system.

The prognosis in patients with retroperitoneal hemorrhage will vary and is dependent entirely upon the etiology of the condition.

SAMUEL H. KLEIN, M.D.

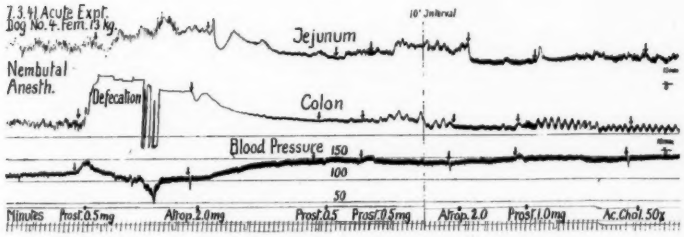

Fig. 1. Intravenous injections: (1) prostigmine methylsulfate, 0.5 mgm.; (2) atropine sulfate, 2.0 mgm.; (3 and 4) prostigmine methylsulfate, 0.5 mgm.; (5) atropine sulfate, 2.0 mgm.; (6) prostigmine methylsulfate, 1.0 mgm.; (7) acetylcholine HCl, 50 gammas.

Schwartz, A. H., Reingold, I., and Necheles, H.: A Study on the Mechanism of Action of Prostigmine on the Intestinal Motility in the Human Being and in the Dog. *Surgery*, 1942, 11: 746.

The authors' researches with prostigmine were directed specifically to the problem: "Whether under pathologic conditions such as peritonitis, inflammation or distention of the intestine, any or enough acetylcholine would be liberated at the parasympathetic nerve endings of the intestine to produce peristalsis." With this, and allied questions in mind, tests were performed on patients with ileostomies, cecostomies, or colostomies, and on normal anesthetized dogs.

A rubber balloon was inserted into the fistula and connected with an oil carbon tetrachloride manometer (specific gravity, 1.5), and the intestinal motility was recorded on the kymograph. This method is scientific in every detail and should be studied in the original to be well understood.

Figure 1 gives an informative picture of results with different methods.

The authors make the following summary and conclusions:

The effect of intramuscular injection of 1 mgm. of prostigmine in patients with ileal, cecal, or colonic fistulas has been tested. In every instance a good response of intestinal motility lasting from thirty to sixty minutes was produced. A mixture of prostigmine and acetylcholine did not have any better effect than prostigmine alone. No serious or disturbing associated effects of the injection of prostigmine was observed. In experiments on dogs it was found that the effects of prostigmine on the intestinal musculature are two-fold: namely, through stimulation of the parasympathetics and through direct stimulation of the intestinal musculature. Following atropinization of the animal, acetylcholine was not effective, while prostigmine still evoked distinct rhythmic motility and increased tone of the jejunum and colon. The authors believe, therefore, that the administration of prostigmine to patients affected with intestinal paralysis is a good procedure. The weight of the patient should be considered in the computation of the dose of prostigmine. Patients below 125 pounds of body weight should receive proportionately less than 1 mgm., which seems to be adequate for persons at or above that weight.

MATHIAS J. SEIFERT, M.D.

GYNECOLOGY

UTERUS

Goodall, J. R., Altimas, G. T., and Ayre, J. E.: A Clinical and Pathological Study of the Permanently Enlarged Uterus. *J. Obst. & Gynaec. Brit. Emp.*, 1942, 49: 18.

Permanent uterine enlargements of the uterus are classified into: (1) infections, and (2) endocrine imbalances.

The common uterine disease due to an infection is the so-called chronic metritis. This disease has had a varied nomenclature in the literature, such as chronic metritis, chronic arteriosclerotic uterus, fibrosis uteri, and metropathic hemorrhage. Actually it is chronic subinvolution, because it arises only out of the sequelae of an infected abortion or labor at term. In its involution, the uterus has to liquefy approximately 900 gm. of superfluous uterine tissue. When destruction is only partial, the tissues remain in a state of incomplete catalysis and leave the uterus permanently surcharged with dead or inactivated remnants. These redundancies become permanent and grow more abundant as age and multiparity increase. Any arrest in the rate of involution causes a partial block upon the involution processes and permits a crystallization of tissue in the state in which the block finds it. Local, often low-grade, infection is the usual cause.

The essential feature of these infections which lead to chronic subinvolution is that they produce a low-grade lymphatic block, not only of the lymphatic vessels, but of the intercellular lymph spaces. The result is a filling of the lymph channels with a proliferated endothélial overgrowth and consequent lymph stasis. The disease, when in the chronic state, is usually symptom-free. The symptoms associated with chronic metritis usually arise out of associated diseases, such as prolapse owing to improper involution of the supporting structures, or backache due to an extension of the infection into the post-uterine parametric tissues. The menstrual cycle and flow usually do not change.

Enlargement of the uterus due to endocrine imbalance may be symmetrical or asymmetrical.

Symmetrical enlargements may be: (a) general; (b) an endometrial endometriosis; or (c) a diffuse uterine parietal endometriosis.

Asymmetrical enlargements may be associated with (a) fibroids, myomas, fibromyomas; (e) endometriomas; or (f) combinations of (c) and (d), such as adenomyomas, and adenofibromyomas.

The author believes that the common cause of these uterine enlargements is hyperestrinism. The hyperestrinism may be entirely intracellular—retained in the specific cells of the pelvic organs. Therefore the urine estimation of the estrin content may be very misleading in these circumstances. The enlargement of the uterus in these circumstances is a hypertrophy of the normal constituent elements of the uterine wall under the stimulus of hormonal action, similar in many respects to that of pregnancy, but differing in minor selective details. The author generalizes that all these diseases have a common abnormal endocrine cause, and that the variations in their manifestations are just evidences of tissue selectivity for the operation of these causes. Because of the similarity of this abnormal hypertrophy to that of normal pregnancy, he infers that the difference is probably quantitative, rather than qualitative.

In endometriosis we may have purely endometrial hypertrophy due to hyperestrinism, or the disease may be spread from the basal endometrial layer into the myometrium and beyond the uterus by the lymphatic channels, or the endometriosis may spread by the veins. Lastly, endometriosis may spread by continuity of surface through the fallopian tubes, which constitutes the spill method. The implants which soil the pelvic peritoneum practically all arrive by the spill method of spread. Practically all of these, when so implanted, respond to the cyclic menstrual changes, and give rise to bloody extravasations, because the cells have been derived from the desquamated surface layer of the endometrium and these are very susceptible to ovarian hormonal effects, and they carry over this trait to their new peritoneal soil. Uterine endometriosis involving the uterine musculature is derived from the deepest layer of the endometrium, which does not normally respond to the ovarian hormones, so when the endometrium abnormally invades the deep uterine lymphatic spaces it does not respond to the cyclic changes, and never bleeds menstrually.

Only a percentage of cases of endometriosis are active at the time of operation. If the tissues of undoubted clinical endometriosis removed at operation are sent to the pathologist, in only about one-third is the diagnosis confirmed. The hormonal imbalance that primarily gave rise to the endometriosis is often merely a temporary aberration, and nature, in two-thirds of the cases of endometriosis, restores the hormonal balance spontaneously, and in these circumstances the disease is not only arrested, but regresses. Therefore, if one can recognize the signs of the arrest of the disease, one can afford to be conservative in the operative removal of organs.

The symmetrical hypertrophies simulate an early pregnancy in every detail of bimanual examination. Menstruation is not affected and the only diagnostic sign between it and early pregnancy is the absence of the Ascheim-Zondek sign.

In the asymmetrical growths we find the common association of uterine hypertrophy with fibroids, myomas, and the admixture of these with endometriomatous elements, or we find uterine hypertrophy in association with endometriomas. These

common associations point strongly to a common stimulating agency. More interesting than this association is the lack of incidence of pregnancy with these diseases—a fact which bespeaks an abnormal endocrine balance.

Regarding fibroids, the author believes that degeneration of fibroids is not always due to defects in vascularization, but is chiefly due to spontaneous restoration of the normal hormonal balance and withdrawal of the abnormal stimulating agent which brought them into being. If the uterus is still greatly hypertrophied in the presence of fibroids, the chances are that the disease is still active. If, on the other hand, this hypertrophy of the uterus has passed, and involution has taken place, then we can assume that the hormonal balance has been restored. DANIEL G. MORTON, M.D.

Buteler, E., and Oulton, C. A.: Vascular Injections in the Course of Hysterosalpingography (Inyecciones vasculares en el curso de la histerosalpingografía). *Bol. y trab. Soc. de cirug. de Córdoba*, 1941, 2: 338.

Very serious consequences have been attributed to the injection of iodized oil into the uterus for the purpose of hysterosalpingography. In the surgical service of the San Roque Hospital the authors have carried out such injections in 350 cases, keeping the patients under roentgenoscopic control. They have never had any serious accidents and have seen penetration of the iodized oil into the veins in only 2 cases, or 0.70 per cent.

They do not believe that the injection of the veins was caused by too high pressure, for they used only 150 mm. of mercury pressure in these cases, while in others they have used as high as 400 mm. without any ill effect. Nor do they believe it was caused by injury of the endometrium by the sound, as they used an olive-tipped sound that could hardly have caused any damage. They believe the cause was pathological changes in the endometrium which permitted the penetration of the vessel walls by the lipiodol.

The 2 cases are described in detail and illustrated with roentgenograms. In both there were serious changes in the endometrium. In the first case there was a three months' ectopic pregnancy and in the second tuberculosis of the endometrium, both changes which decrease muscle tone and favor relaxation of the vessel walls. In the first case the patient felt pain and had a taste of mustard in her mouth and had a severe attack of coughing. Roentgenoscopic examination showed a tree-shaped image and two parallel cords descending along the spinal column, marking injection of the pampiniform plexus and the ovarian veins. The lipiodol injection was stopped at once and, after operation for the ectopic pregnancy, recovery was uneventful.

In the second case there was injection of the uterine veins on the left side, in this case, too, without serious consequences. The most serious danger is that of oil embolism, from which only 1 case of death is reported in the literature, and in this case there was a history of such serious damage to the endometrium that hysterosalpingography should hardly have been attempted. The best way to avoid serious results is by manometric control of the pressure under which the injection is made and screen control during the injection to detect the first signs of penetration of the iodized oil into the vessels, at which time the injection should be stopped at once. AUDREY G. MORGAN, M.D.

MISCELLANEOUS

Rieper, J. P.: Two Hundred Colposcopic Examinations (Em torno de 200 casos de colposcopia). *An. brasil. de ginec.*, 1942, 7: 89.

The author performed colposcopic examinations on 200 patients and tabulated the results according to the age of the patients and the clinical and colposcopic diagnosis. The method is of great value chiefly for the early diagnosis of carcinoma of the cervix, but it renders good service also in the early recognition of other gynecological conditions, as it reveals sources of bleeding and suppuration. It helps to elucidate secondary conditions following prolapse and to establish indications or contraindications for certain operations in the presence of atypical epithelium. The real character of cervicitis may be disclosed, the effectiveness of treatment of such cases may be watched, and small rectovaginal and vesicovaginal fistulas may be visualized; the condition of the hymen may be studied. The method is of value also from the didactic point of view and, finally, it inspires research in various fields. In a large number of cases biopsy may be avoided if colposcopy is employed. The efficiency of conservative treatment of cervical lesions may be watched.

Only in 16 of 200 cases a normal mucosa was found, which demonstrated the frequency of cervical lesions and the importance of colposcopy as a dependable method for prophylaxis and early diagnosis of cancer of the cervix, as well as for detecting other gynecological conditions of the cervix.

The author concludes that Hinselmann's colposcope is an invaluable addition to the gynecological armamentarium. JOSEPH K. NARAT, M.D.

Boynton, R. E., and Winther, N.: The Treatment of Primary Dysmenorrhea with Estriol Glycuronide; a Control Study. *J. Am. M. Ass.*, 1942, 119: 122.

Previous studies in the use of endocrines in primary dysmenorrhea have had no controls. This study presents the results of the treatment of dysmenorrhea in a group of 100 young unmarried women, 50 of whom were given estriol glycuronide and 50 a placebo. Twelve per cent of the group receiving estriol glycuronide and 8 per cent of the group receiving placebos reported complete relief from dysmenorrhea for a period of from nine to twelve months. Thirty-eight per cent of those receiving

estriol glycuronide and 58 per cent of those receiving the placebos obtained no relief whatever. This study shows the need for careful controls in the evaluation of therapeutic measures. T. FLOYD BELL, M.D.

Haydon, G. B.: A Study of 569 Cases of Endometriosis. *Am. J. Obst. & Gynec.*, 1942, 43: 704.

The etiology of endometriosis is still an unsolved problem. The incidence of endometriosis was 10 per cent in the 4,500 gynecological surgical cases reviewed. The age incidence varied from sixteen to seventy-eight years, being greatest in the childbearing years. There was a relative sterility of 53 per cent in the series.

Dysmenorrhea, menorrhagia, backache, dyspareunia and abdominal pain are the important symptoms. Fibroids, retroversion, endocervicitis, and outlet relaxation are the frequent associated pathology.

Location of the lesions is most frequently in the uterus, cul-de-sac, and ovaries. Ovarian function was retained in 503 of 569 patients operated upon. A total of 88.3 per cent of the patients remained symptom-free postoperatively. There were 19 pregnancies after operation. EDWARD L. CORNELL. M.D.

Anspach, B. M., and Montgomery, J. B.: The End-Results of the Simpson Operation in Sixty-One Patients Delivered at Term. *Am. J. Obst. & Gynec.*, 1942, 43, 690.

During the childbearing age, treatment of retroversioflexion of the uterus may be required: (a) to promote conception, (b) to favor the normal course of pregnancy, and (c) to relieve various symptoms, the most frequent of which are low abdominal distress and backache, worse in the erect posture and upon exertion, better when lying down.

The procedure of choice is postural (knee-chest and Sims' positions), followed by manual replacement and the fitting of a Smith pessary. An exception should be made when the condition is discovered for the first time in early pregnancy. Nothing more than posture, and very gentle efforts at bimanual replacement, are needed in the great majority of cases. The manipulation incident to the formal fitting of a pessary during early pregnancy may provoke abortion.

The relief afforded by the pessary proves the role of the condition in the production of symptoms. When the uterus is in good position within two weeks of delivery, and the patient is fitted with a Findley model pessary and wears it for three months, there is a small but definite chance of cure. When the patient wishes prompt and permanent relief and when the pessary is uncomfortable or fails to hold the uterus, recourse may be had to operation. The operation must be of such a type that there is no disadvantage to the patient during a subsequent pregnancy and labor. The prospect of recurrence of the displacement after labor is very small. The Simpson operation gives almost uniformly satisfactory results. Of 61 patients delivered at term, 58 were cured.

EDWARD L. CORNELL, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Arnot, P. H.: The Duration of Pregnancy. *West. J. Surg.*, 1942, 50: 115.

The histories of 3,606 patients have been reviewed in an effort to determine the length of pregnancy. This was found to be 280.8 ±10.2 days.

Fifty-three and five-tenths per cent of the patients delivered later than the expected date of confinement, 42.44 per cent delivered before, and only 4.07 per cent delivered on the estimated date.

The average number of days late was 8.24 and the average number of days early was 8.56.

While it is usually agreed that 280 days is the average length of pregnancy as figured by Naegele's rule, it is also agreed that from 265 to 270 days is the average actual duration of pregnancy as figured from the time of conception.

There is a tendency for women with shorter cycles than every twenty-eight days to deliver early, and those with longer cycles to deliver late. Apparently some women are able to develop a mature child sooner than others. However, statistical analysis does not confirm this. A marked tendency was found for women to be consistent in the onset of their labors. If they were late with one baby they were very apt to be late with subsequent babies.

Many factors influence the duration of pregnancy, such as excessive distention of the uterus due to hydramnios or twin pregnancy (premature labor). Race, state of nutrition, toxemia, and infection also have an influence on the time of onset of labor.

The baby's weight alone will not accurately determine prematurity or postmaturity.

For uniformity, the author suggests that in using Naegele's rule, one first count back three months and then add seven days.

DANIEL G. MORTON, M.D.

Goldberger, M. A., and Frank, R. T.: A Biological Assay of the Estrogens in Pregnancy Blood. *Am. J. Obst.*, 1942, 43: 865.

A biological assay of the estrogens in the blood of 86 pregnant women, from the fifth to the fortieth week of gestation, was performed.

Attempts to increase the yield by hydrolysis of the blood were unsuccessful. Combined ether and alcohol extraction was found to be more efficacious than ether extraction or alcohol extraction alone.

A graphic presentation of the results of this study shows that the greatest amount of estrogens is present just before labor. The estrogens in the blood increase slowly from the fifth week of pregnancy in each individual case; but not before the seventeenth week did any of the cases studied reach a level above the upper limit of estrogens in nonpregnant women.

From the seventeenth week of pregnancy a progressive increase of estrogens in the blood took place. Some parallelism of blood estrogen increase and free urinary estrogen increase appears to exist. The estrogens in the blood probably circulate as free estrogens.

EDWARD L. CORNELL, M.D.

Waters, E. G.: Weight Studies in Pregnancy. *Am. J. Obst.*, 1942, 43: 826.

Analysis of weight data of 3,230 patients indicates an average maternal weight gain of 23.2 lb. and a fetal weight gain of 7.4 lb. The baby's birth weight is not related to the maternal weight gain or loss unless the patient is diabetic or the gain is excessive.

Post-partum weight loss is within 5 lb. of the total gain for all patients who gained the average poundage. However, with excessive weight gain, 60 to 80 per cent of the weight gain in excess of normal will be retained, except in hydropic patients.

In general, it may be said that the amount of weight gained has relatively little effect upon the duration of labor, although excessive weight gain definitely increases the number of complications.

Weight gain *per se* is of little significance in the consideration of toxemia unless the weight gain is typed. The vast majority of all patients gaining an abnormal amount do not become toxemic. However, the toxemia incidence definitely rises as weight gain in excess of normal appears. Differentiation of hydropic from stereoplastic weight gain is of more value. For it is in the "edema group" (and most notable when edema is occult or nonstatic in type) that the incidence of toxemia is increased. Practically, however, sharp differentiation of the two is not always simple, and may depend upon clinical response to dehydration therapy in suspected weight gainers. Calculations of fluid retention, based upon fluid intake and urine output, is of added value in deciding how to type such patients, to further the prognostic worth of weight observation.

EDWARD L. CORNELL, M.D.

Sala, S. L., and Bergdolt, E. G.: New Experiences with the Diagnosis of Placenta Previa by the Use of Cystography (Nuevas experiencias sobre el diagnóstico de la placenta previa por medio de la cistografía). *Arch. clin. obst. y ginec. Eliseo Canton*, 1942, 1: 164.

The authors continue to employ the same technique as described previously (*Bol. Soc. Obst. y Ginec. Buenos Aires*, 1940) except that only 25 cc. instead of 40 cc. of the 12.5 per cent sodium iodide solution are instilled into the bladder. The roentgenographs are taken in the dorsodecubital position with the maximum incidence of rays in the midpoint of the puboumbilical line, with a constant focal distance of 76 cm., and 65 kv. and 100 ma.

Normally the roentgenographic shadows of the fetal cranium and of the contrast media in the urinary bladder are in close apposition, and when there

Fig. 1.

Fig. 2.

Fig. 1. Cystogram with normal attachment of placenta. The fetal cranium is in close apposition to the bladder opacity.

Fig. 2. Cystogram with placenta previa. The fetal cranium is separated from the bladder opacity by a distance of 1 cm. or more.

is a separation between them it is never as much as 1 cm. This space represents the thickness of the vesical wall, the inferior segment of the uterus, and the scalp of the fetus, all of which tissues are readily permeable to the rays (Fig. 1).

However, when the insertion of the placenta is sufficiently low (previa) to interpose itself between the fetal head and the roentgenographic shadow of the bladder, this space between the two shadows is greatly augmented (Fig. 2). The diagnosis should be made only during the eighth or ninth month of gestation as the cephalovesical separation during the seventh month may normally be more than 1 cm.

The procedure has been found to be 76.5 per cent accurate when used to confirm a placenta previa and 92.6 per cent accurate when used to exclude placenta previa.

Causes of error include the pendulous abdomen, rectal distension, hydramnios, lateral flexion of the uterus, short umbilical cord, and the posterior varieties of low insertion of the placenta.

FRANK MCDOWELL, M.D.

Simrall, J. O. H.: An Analysis of Late Morbidity in 100 Cases of Pregnancy Toxemia. *Am. J. Obst.*, 1942, 43: 858.

The chief morbidity to be found in toxemia patients at late post-partum examination is hypertensive disease. The observation, published by Teel and Reid, concerning the fall in blood pressure which they observed during the second trimester in women with essential hypertension, makes it seem likely that much of the morbidity which the literature has attributed to toxemia may be due to antecedent, unrecognized vascular disease. It is suggested that patients who do not have reliable vascular and renal estimations prior to the toxemic pregnancy be omitted from morbidity studies. In the study there was no evidence of significant vascular or renal morbidity in patients known to be in normal condition prior to their toxemic pregnancies.

EDWARD L. CORNELL, M.D.

McLaren, H. C., and McLeod, M.: A Case of Diabetes Insipidus in Pregnancy. *J. Obst. & Gynaec. Brit. Emp.*, 1942, 49: 51.

The occurrence of diabetes insipidus in pregnancy is extremely rare. In 1936 Henriet could only trace 11 cases in the literature. The authors' case was one of diabetes insipidus commencing at the thirty-fourth week of pregnancy.

The patient was a primigravida, aged thirty-three. When she was twenty-two weeks pregnant the patient fell heavily and fractured her clavicle. She also struck her right cheek, but the injury was slight. Quite suddenly, when thirty-four weeks pregnant, she began to suffer from intense thirst and polyuria. Frequency of micturition caused severe insomnia. She became drowsy and found increasing difficulty in thinking and speaking clearly. Persistent nausea developed which was relieved by vomiting or by taking bicarbonate of soda. Sharp pain was felt deep to the xiphisternum on swallowing. Constipation was marked. Her appearance altered markedly. A dark pigmentation spread over the body. Her appearance became old and wizened.

On examination, her skin was markedly dehydrated, although there was slight edema of the tibia and lower back. Desquamation of hypertrophic skin of the hands and soles of the feet was noted. Slight conjunctival jaundice was present. The heart, lungs, and abdomen appeared normal. The blood pressure was 108/60; pulse rate, 100; and temperature 98.4°F. The normal gestation was thirty-six weeks old. The urine contained acetone but no albumin or sugar.

The eyes were normal. Analysis of the cerebrospinal fluid gave normal results. Roentgenograms of the sella turcica and long bones were also normal. The Wassermann reaction of the blood was negative.

Intense thirst, vomiting, and polyuria continued unabated for forty-eight hours. The patient's condition became increasingly grave. Because of vaginal hemorrhage, labor was induced after twenty-four hours. A 6 lb. 2 oz. child was born dead.

The primary cause of death was presumably asphyxia following premature separation of the placenta. There was a retroplacental clot of moderate size and recent origin. Erythropoiesis and hemosiderosis were excessive in the liver and spleen.

In the puerperium polyuria and thirst rapidly disappeared. Seventy-four days after delivery the average output of urine was 3 pints. The patient was given pitressin and pituitrin during the first five postpartum days. The slight conjunctival jaundice which was noted on admission spread over the body during labor. At first the liver was not palpable. After ten days, however, it was easily felt 3 fingerbreadths below the costal margin. The icteric index was 50. The jaundice disappeared fourteen days after delivery. On the seventy-fourth day the liver was no longer palpable. In the puerperium edema became fairly marked and generalized, but disappeared shortly.

Bleeding occurred from the vagina for three days after delivery. The loss of blood was not excessive. The hemoglobin level, however, fell from 60 per cent to 45 per cent. On the third night the patient suddenly collapsed. She did not lose consciousness, however, and recovered quickly after treatment with a shock-cradle and transfusion with 600 cc. of blood. The maintenance of normal chloride levels in the urine, blood, cerebrospinal fluid, and liquor amnions was remarkable in view of the large amount of fluid-exchange.

The patient regained her normal pleasant appearance eight weeks after discharge. She complained of cramp-like pains in the calves of her legs and occasional mild headaches. Her vision became blurred if she read for more than a few minutes. A full examination which included visual fields and acuity, roentgenograms of the sella turcica and long bones, biochemical analysis, and a blood-count disclosed nothing abnormal.

Recent experimental work explains diabetes insipidus as a disease caused by a deficiency of the antidiuretic hormone of the posterior pituitary lobe in the presence of an intact anterior lobe. It seems likely that the anterior lobe has a diuretic action, although this function is possibly indirect.

Pregnancy appears to have been the main predisposing factor. There are, however, several cases in the literature in which the clinical picture is entirely different. Duvoir's patient, for instance, had diabetes insipidus for seventeen years. She became pregnant on 3 occasions, and on each occasion the disease improved but returned again in the puerperium.

Hemorrhage in this case was of doubtful origin, but the possibility of temporary deficiency of the oxytocic factor seems to be an etiological factor. Jaundice in the puerperium may have been coincidental. Similar manifestations were not encountered in the literature. Other interesting features of the case, such as torpor, dyspepsia, and paradoxical sweating, are apparently rare features in diabetes insipidus. DANIEL G. MORTON, M.D.

Taylor, H. C., Wellen, I., and Welsh, C. A.: Renal-Function Studies in Normal Pregnancy and in Toxemia Based on Clearances of Inulin, Phenol Red, and Diodrast. *Am. J. Obst. & Gynec.*, 1942, 43: 567.

In normal pregnancy the glomerular filtration rate, effective renal blood flow, and tubular excretory function are normal as determined by inulin, phenol red, and diodrast clearances and diodrast Tm. There is no evidence that in uncomplicated pregnancy, kidney function is in any way affected. In toxemia there is a slight reduction in the filtration rate, when comparison is made with the post-partum values in the same patient, also an adequate renal blood flow or actual renal hyperemia, and a slightly reduced filtration fraction.

These conditions afford a striking contrast to the findings in essential hypertension in nonpregnant individuals. With clinical cure after delivery, there are a rise in filtration rate, a fall in effective renal blood flow, and a high filtration fraction. This picture of efferent arteriolar spasm and renal ischemia is like that characteristically found in essential hypertension.

The high effective renal blood flow found in association with the increased arterial blood pressure of the acute phase of toxemia is evidence against the view that renal ischemia is the primary cause of hypertension. EDWARD L. CORNELL, M. D.

Cunningham, J. F., and McGrath, J.: Dysgerminoma; a Complete Report on a Case of Bilateral Dysgerminomas Complicating Pregnancy with Malignant Secondary Deposits and Fatal Termination. *J. Obst. & Gynaec. Brit. Emp.*, 1942, 49: 36.

The patient was a primigravida, aged twenty-seven years. She had been married for two years, had always had good health, and her menstruation had been regular and normal. Apart from one slight hemorrhage about the tenth week, her pregnancy had been uneventful until the thirty-sixth week. After this she had repeated attacks of vomiting, which progressed until her admission at the thirty-ninth week. The patient started labor spontaneously two days later. The head of the child remained unfixed. Rectal examination revealed a large solid mass in the pouch of Douglas. This tumor could not be displaced. A lower-segment cesarean section was immediately performed and a healthy living male infant, weighing 8 lb. 4 oz., was extracted.

Two large ovarian tumors were then exposed and removed. Both tumors had fairly long pedicles. The

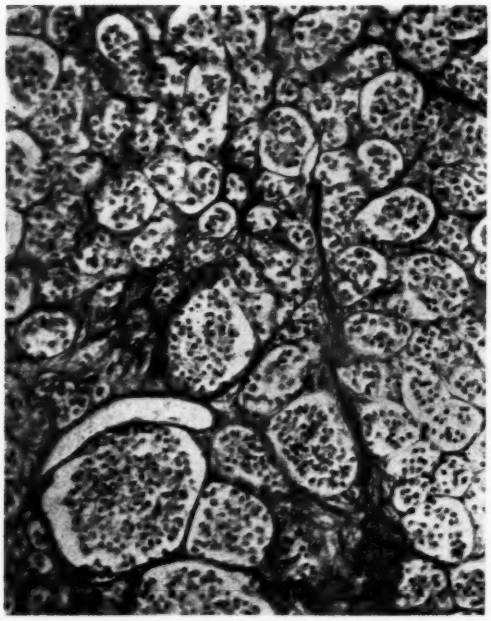

Fig. 1. Microphotograph illustrating the histological structure of part of the original tumor.

larger was roughly kidney-shaped, measuring about 27 cm. in length by 14 by 12 cm. The smaller was roughly ovoid, measuring about 14 by 12 by 9 cm. Both tumors were identical in their general and histological characteristics. The surface was covered by a thin pseudocapsule carrying fairly numerous blood vessels, and it was roughly lobulated. When cut into, the tumors were seen to be composed of firm, rather elastic whitish tissue. The central areas of both showed mucoid degeneration. The microscopic features may be seen in the accompanying illustration. These histological features clearly indicate that both tumors are dysgerminomas. The patient made a rapid recovery following her operation. She was given a course of deep radiation, as such tumors are believed to be sensitive to radiation.

Within about four months she showed signs of general abdominal involvement with ascites. She rapidly became weak, anemic, and cachetic. She died on the fifth of March, fourteen months following her operation. At the post-mortem examination the patient was found to be very emaciated, with edema of the legs and massive ascites. The skin was yellow. The peritoneal cavity contained rather more than 2 gallons of a straw-colored cloudy fluid. The liver was found to contain massive multiple secondary growths which composed about nine-tenths of its volume. Some of the secondary growths had extended to the transverse colon and the diaphragm adjacent. There was a small secondary deposit about 1 cm. in diameter in the lower lobe of the right lung. The heart and kidneys were free from secondary deposits. The uterus was small and atrophic and buried in dense adhesions. Histological examination showed that the secondary deposits in the liver and aortic glands, and the growth spreading from the glands into the pancreas were cytologically identical with the primary growth in the ovaries.

The case is of special interest because of:

1. The rather large size of the tumors.
2. Their bilateral occurrence.
3. Their occurrence in association with pregnancy.
4. The remarkably large secondary deposits which developed in the liver within a year.

Rockerty estimates that the literature contains records of about 200 cases of dysgerminoma. He estimates that 45 per cent of these were malignant, more especially those which were found to be bilateral (about 35 per cent of the total number). The great majority of the cases recorded were associated with hypoplasia of the genital organs.

Dysgerminomas arise from cells misplaced at the time of sexual embryonal growth of the gonad when the mesenchyme is as yet undifferentiated and neutral. A similar tumor, the seminoma, occurs in the testis. Dysgerminomas, therefore, behave in marked contrast to the granulosa-cell tumor, which due to its hormone has a feminizing influence, and to arrhenoblastoma which has a masculinizing influence. The dysgerminomas, since they do not produce any hormone, have no influence on menstruation or otherwise. Most of the tumors reported were in patients between the ages of ten and twenty-five.

DANIEL G. MORTON, M.D.

LABOR AND ITS COMPLICATIONS

Bickers, W.: A Study of Contractions in Labor Based on Kymographic Records Obtained From an Intrauterine Balloon. *Am. J. Obst.*, 1942, 43: 815.

The extraovular, high fundal, intrauterine balloon connected to a mechanical ink recorder was used to study the patterns of uterine motility during labor. Labor contractions during the early first stage have a relatively low amplitude superimposed on moderate tetany. As labor progresses with intact membranes tetany becomes more marked. Labor contractions after rupture of the membranes, spontaneous or artificial, are characterized by the absence of tetany. The increased amplitude which results augments the expulsive efficiency of each contraction.

EDWARD L. CORNELL, M.D.

Van Del, D. T.: The Use of Intravenous Dial Urethane in Obstetrics. An Analysis of 2,000 Cases. *J. Missouri State M. Ass.*, 1942, 39: 100.

Dial urethane was employed intravenously as an analgesic in 2,000 cases of labor. Of the mothers, 1,458 were primiparas and 542 were multiparas. To those in whom the cervix was dilated about 2 cm.

and pains were strong and regular, a total of 4 cc. of dial urethane (dial gr. 6, urethane gr. 24) was given intravenously over a period of ten minutes. One-half hour later ⅛ gr. of morphine sulfate was given hypodermically. Inhalation ether in small amounts was administered as the head was born.

Labor terminated spontaneously in 1,292 patients and operative aid was given to 708 patients. Episiotomies were included in the operations. There were no stillborn infants. Thirty-nine infants required resuscitation. No accidents of intravenous technique occurred. Excitation over a period of not more than an hour was noted in 10 patients, all of whom experienced amnesia and analgesia of definite degree and duration.

The author states that labor in this large group of patients was statistically shortened (compared with averages given by DeLee and Williams). This, he believes, was due to the effect of the dial in prolonging uterine contractions which were followed by a longer rest phase. (Kymographic studies were reported in an earlier series of 1,200 labors in which dial urethane was employed.)

During the injection of dial urethane, which must not exceed 1 cc. per minute, the blood pressure undergoes a moderately rapid fall and reaches its lowest point fifteen minutes after the injection is begun. Acceleration of the pulse and respiration occurs simultaneously and parallels the blood pressure in a gradual return to normal.

The following procedure was used in 100 cases of low cervical cesarean section; the operations were elective:

Two capsules of nembutal were given the night before the operation, 2 more were given two hours preceding the operation, ¼ gr. of morphine was given one-half hour before the operation, and 4 cc. of dial were given intravenously just before the abdominal preparations were begun. The only other anesthetic agent used was 1 per cent novocaine (infiltration). The operative time was about one hour, during which the patients were completely relaxed. "All babies were full term and breathed within a few minutes of birth." E. S. BURGE, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Stansfield, F. R.: Puerperal Cerebral Thrombophlebitis Treated with Heparin. *Brit. M. J.*, 1942, 1: 436.

Stansfield, of East Suffolk and Ipswich Hospitals, England, reports 2 cases of puerperal cerebral thrombophlebitis. One terminated fatally but the second was successfully treated by the intravenous administration of heparin. The author searched the literature and found 14 definite cases of cerebral thrombophlebitis during the puerperium. The inclusion of these 2 cases gives a fatality rate of 56 per cent. This figure is high, no doubt, as only the more severe cases are recognized.

Stansfield discusses the experimental work of Batson which reveals the possibility of the passage of emboli from the pelvic veins through the vertebral venous plexuses to the cerebral veins. Straining on a bed pan favors this condition by producing a rise of pressure in the inferior vena cava. The symptoms, signs, and differential diagnosis are briefly and concisely outlined.

As treatment the author recommends promotion of the circulation in the lower extremities by the use of a footboard, exercises, and elevation of the head of the bed. Tight abdominal binders are to be avoided. Heparin may be used prophylactically. Curative therapeutic procedures are: (1) the administration of heparin by the continuous intravenous drip method; (2) reduction of the intracranial pressure by lumbar puncture, 50 per cent glucose solution to be given intravenously, or magnesium sulphate to be given intramuscularly; (3) the control of convulsions with chloroform followed by avertin per rectum or the injection of sodium phenobarbital.

WILLARD FRENCH, M.D.

MISCELLANEOUS

Butler, H. M.: The Examination of Cervical Smears as a Means of Rapid Diagnosis in Severe Clostridium-Welchii Infections Following Abortion. *J. Path. & Bacteriol.*, 1942, 54: 39.

In cases of postabortional infection or suspected infection with the clostridium welchii, an attempt has been made to correlate certain characteristics of the cervical smear with the severity of the infection. Reference to the table shows that by considering only gross differences it was possible to allot the smears from each of the 84 cases to one or another of seven categories.

TABLE I.—CHARACTERISTICS OF CERVICAL SMEARS IN INFECTIONS WITH CLOSTRIDIUM WELCHII

Characteristics of the cervical smears			20 cases of severe infection	64 controls
Clostridium welchii	Capsules	Damage to leucocytes		
Many	Heavy	Considerable	20	0
Many	Heavy	Slight or absent	0	3
Many	Slight or absent	Considerable	0	2
Many	Slight or absent	Slight or absent	0	3
Few	Heavy	Slight or absent	0	6
Few	Slight or absent	Slight or absent	0	18
None	Slight or absent	Slight or absent	0	32

In all smears from the cases of severe infection many clostridium welchii bacilli were present, capsulation was heavy, and cell damage was considerable, while not one of the smears from the 64 control patients had similar findings.

It was thought possible that the presence in the cervical smear of a few heavily or very heavily capsulated bacilli unaccompanied by appreciable cell destruction might represent the initial stage of a severe infection. So far there is no evidence of this, as not 1 of the 6 patients from whom such smears were obtained developed signs of serious infection, although only 1 of them was treated with antitoxin. When many heavily capsulated clostridium welchii bacilli were present in the cervical smear but damage to the cells had not occurred, either the patient's resistance was greater than normal or the infecting strain, although heavily capsulated, lacked some factor responsible for a high degree of virulence.

These observations show that the appearance of the cervical smear has proved an accurate index of the severity of infection and, since in some cases the smears were obtained when clinical signs were insufficient to establish the diagnosis, the examination of cervical smears can be regarded as a valuable diagnostic method. DANIEL G. MORTON, M.D.

Beebe, G. W., and Overton, J.: Contraceptive Service. *J. Am. M. Ass.*, 1942, 118: 1045.

Since 1937, 727 patients were observed over a total of 6,812 months during which they were exposed to the possibility of becoming pregnant, and the report demonstrates that very extensive fertility control among these indigent white patients is feasible. The patients were selected for high fertility and in the interest of family limitation. Despite a ready willingness to try the two methods advised, however, neither diaphragm and jelly, nor foam powder and sponge proved sufficiently acceptable to prevent patients from rapidly leaving the service. This difficulty pervades all contraceptive services organized on the basis of a single or central method, usually with the diaphragm and jelly. The authors believe that the more individualized prescription of a wider variety of methods might make the service more effective, as would any change which reduced the likelihood of irritation or other pain and discomfort, or which enhanced confidence in the techniques prescribed.

A comparison of the two prescriptions presented certain hazards because foam powder was advised for patients for whom the diaphragm method was deemed unsuitable. Detailed comparison at many points, however, supported the view that the two method groups were alike in their uncontrolled pregnancy risk and in their contraceptive skill and interest. The diaphragm and jelly proved much more acceptable to patients advised in its use than did the foam powder. This is of special interest in the face of current effort by some birth-control enthusiasts to encourage the widespread use of foam powder. The protection received from the diaphragm and jelly also exceeded that obtained from foam powder by a wide margin, the effectiveness percentages being 88 and 63. Analysis of the factors influencing the chance of conception within each method group left little doubt that the difference is one of methods rather than one of patients.

E. S. BURGE, M. D

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Bywaters, E. G. L., Belsey, R., McMichael, J., Dunn, J. S., and others: Discussion on the Effects on the Kidney of Trauma to Parts other than the Urinary Tract, Including Crush Syndrome. *Proc. R. Soc. M.*, Lond., 1942, 35: 321.

BYWATERS: Impairment of urinary excretory function after severe injuries is not uncommon, but little is known about how it is produced. It seems likely that several different mechanisms are involved. With more complete investigation of these cases, it may be possible to sort them into several classes, each group depending on the particular type of functional lesion involved and on the particular etiological agent.

Impairment of renal function after trauma to distal parts:

A. Functional azotemia due to decreased glomerular filtration or increase in the formation of waste products:
   Oligemic shock, including hemorrhage.
   Dehydration or electrolyte loss.
   Pericardial tamponade and vascular stasis.

B. Organic changes:
   Crushing injury, burns, some types of obstetrical shock, traumatic liver necrosis, intravascular hemolysis, tubular or ureteric blockage due to sulfapyridine.

After severe traumas with hemorrhage and laceration, including those inflicted by the surgeon, oliguria is usually noted; this may sometimes be accompanied by a faint trace of albumin and hyaline casts in the urine and, more rarely, by a small rise in blood-urea concentration. Bywaters has classified this type as functional impairment of excretion, because renal tubular function itself is seldom, if ever, permanently affected; complete recovery ensues. A similar type of functional impairment, that following gastrointestinal hemorrhage, which was first observed in 1934 by Sanguinetti, has received much critical attention recently; there appear to be at least four factors which are involved:

1. Increased protein breakdown in the small gut gives rise to increased urea formation in the liver; this increase depends directly on the rate of amino-acid absorption and on adequate deamination by the liver.

2. External hemorrhage itself, according to Black, working on dogs, produces a very slight impairment of excretory function, as shown by the delayed excretion of ingested urea. This is probably due to diminished blood flow resulting from decreased blood volume. In addition, dehydration and electrolyte loss due to vomiting, which is not an infrequent clinical complication, will further reduce excretory power perhaps because of a similar decreased renal blood flow. Davis has shown a non-protein nitrogen rise of about 100 per cent following anhydremia in dogs produced by the subcutaneous injection of 25 per cent saline solution.

3. Decreased renal reserve may be a factor, particularly in the elderly: Wallace and Schafer have shown that after venesection of a liter of blood, urea rises only in patients with hypertension and renal sclerosis.

4. The oliguria accompanying the systolic pressures below that necessary for glomerular filtration to occur may produce a more lasting effect on the kidneys, as is recorded by Stafford after a stab wound of the heart, in which case pericardial tamponade developed and the blood pressure remained at or below 60 mm. of mercury for fifteen hours; there was oliguria for eight days with blood casts and albumin, a blood urea rising to 220, hypertension, and an excretory function temporarily decreased to zero, as shown by serial phenol-red excretion tests.

These four factors, increased protein breakdown, decreased renal blood flow, decreased filtration pressure, and decreased renal reserve, may all possibly play some part in actual clinical cases, both of gastrointestinal hemorrhage and also following trauma. Generally, the renal lesion is functional and not structural.

BELSEY: Only by detailed observation, recorded at the bedside and not from memory when the excitement has gone, shall we obtain the vital pathological data without which there can be no rational approach to the problem of treatment. When several hundred cases of this condition have been fully investigated, clinically and biochemically, then will be the time to become dogmatic about treatment. For the present our attention should be directed to the problem of deciding what the surgeon is trying to do, rather than how he is going to do it.

In the crushed limb the following changes have been observed: first, necrosis of muscle, patchy in distribution and rarely corresponding to areas of damaged overlying skin such as would suggest that the necrosis is due to direct pressure. The muscle is pale and mottled. Hemorrhage into the muscle or tissue planes is not constant. There is edema of the limb and an increase of tension in the tissues within the fascial compartments of the limb.

Loss of nerve function has been recorded in the majority of cases and has commonly involved all the nerves of the limb, a distribution suggesting that the failure of conduction is due to ischemia and asphyxia rather than direct pressure. In the patients who have survived the recovery of nerve function has been steadily progressive over a period of from six to twelve weeks, and usually complete.

Simple fractures may be present, but evidence of gross trauma to the limb is remarkable by its ab-

sence. The overlying skin seldom shows more than slight grazing initially, but with the increasing edema it may show bleb formation in places where there has never been any direct bruising of the skin.

So much for the facts already observed, on the basis of which we assume that there occurs in the crushed limb ischemic necrosis of muscle, due probably to traumatic arterial spasm and possibly to direct pressure also; that with restoration of the blood supply to the limb there occurs a flooding of the circulation with a hypothetical toxin, and an outpouring of fluid into the tissues of the limb from vessels rendered abnormally permeable by asphyxia, which results in an increase in subfascial tension which may in turn be complicated by a recurrence of the vascular spasm.

We do not yet know:

1. How long a period of ischemia or pressure is necessary to produce the changes in muscle that are interpreted as necrosis. The average period of burial or crushing has been about eight hours, but we have recently seen a case in which the patient was trapped for only forty-five minutes at most. A reflex vascular spasm may have been active for a much longer period following the patient's release.

2. Whether toxin production continues after restoration of the circulation of the limb, and whether it is influenced by the metabolic activity of the tissues.

3. At which stage the renal damage occurs, whether it is an early irreversible change, or whether progressive damage takes place during the period of survival of the patient.

4. If muscle necrosis is the sole cause of the renal damage.

Before an attempt is made to assess the influence of surgical treatment on the course of recorded cases of the crush syndrome, it is essential that we establish certain definite criteria of diagnosis, prognosis, and clinical response, and unless these criteria are conscientiously observed, no conclusions can justifiably be drawn. The problem is rendered much more difficult by the fact that several forms of treatment have been used concurrently, and as no strict attention has been paid to the chronological sequence of therapy and response, it has been impossible to determine their relationship.

McMichael: We may safely disregard transfusion and bacterial toxemia as causes of the renal failure. There is little doubt that breakdown (autolytic?) products from dead or dying muscles are the main factors. It should be impressed on rescue parties that the real danger in people with crushed limbs is that of renal failure. Before the patient is released, therefore, every effort should be made by means of abundant warm drinks to ensure a good urine flow. The advantage of a good diuresis may be (1) the dilution of chemical poisons within the kidney tubules, and (2) the prevention of precipitation of myohemoglobin casts.

Dunn, restricting his remarks to the renal pathology in cases of crush syndrome, agreed with Bywaters in finding in the cases which he had examined important damage of the renal tubular epithelium in addition to the presence of brown casts in the lumina. The lesion could be described as an acute tubular nephritis, while its accompanying functional disturbances of anuria or oliguria, marked loss of concentrating power, and retention of urea could readily be paralleled in mercurial nephritis of man and in experimental tubular nephritis of animals.

Riddell has 2 observations to make:

1. If a large number of casualties is admitted to the hospital it is very easy to miss the early crush syndrome unless the casualties are systematically examined. The patient often looks very well and for this reason may temporarily be passed over in favor of examining someone in a neighboring bed who appears to be more dangerously ill. The only way to avoid this and other mistakes is to examine each patient in turn, however rapidly, from top to toe, and then in the case of the crush syndrome, the telltale wheals or simply localized erythema of the skin will draw attention to the lesion.

2. We all know that the crush syndrome is associated with impairment of renal function, but it is perhaps not so well known that other injuries, including operative shock, may also be associated with depression of the renal function. The impairment of renal function following injury varies from a temporary anuria of twenty-four hours' duration to a permanent and fatal variety.

Captain Magner, R. C. A. M. C., reports a case of interest in that the muscle damage was not due to prolonged compression, but rather to sudden severe bruising suffered in a motor accident.

Graham reports an interesting case which he recently encountered, in association with the pathogenesis of renal damage in crushing injury.

Loyd Williamson and Janes reported 2 cases recently in which death from renal failure occurred following severe trauma to the limbs with compound fracture and vessel trauma. They say that in such cases, if it is thought that renal damage is produced by absorption from the damaged limb, the practical question arises whether early amputation will be more effective. Both cases presented evidence of muscle ischemia, and in each there was a definite vascular lesion to account for it.

Clarke: There can be little doubt that minor degrees of renal disturbance following trauma are frequently missed on account of their transitory nature. The following is a case of a major crush involving all the tissues of the leg which resulted from an automobile accident. Shock and hemorrhage necessitated the administration of blood and serum. The leg was amputated and a severe scalp wound explored. Recovery was uneventful. The renal changes were detected as a result of careful biochemical studies. Prior to operation, marked oliguria accompanied a normal blood pressure. This was presumably due to incipient shock. Its prerenal origin is suggested by the subsequent changes in renal function. During and immediately after the operation, a

marked drop in blood pressure was accompanied by polyuria, while the urine at this time showed a high urea concentration, which indicated normal renal function. Later on the rate of urinary output increased still further and numerous hyaline casts were present in several urine specimens. These, we must assume, had accumulated during the earlier phase of decreased renal function. After blood and serum transfusions, amounting to a total of 5 pints, the blood pressure rose to normal and no further changes were observed. Combined clinical and biochemical studies in such cases will no doubt reveal many examples of early changes in renal function.

BLACKBURN: Sodium sulfate is undoubtedly of value in these cases. A good parallel could be drawn from its use in calculous anuria and after urological operations. Similarly, both sodium chloride and sodium bicarbonate given intravenously could be useful, the latter especially in raising the alkali reserve. JOHN A. LOEF, M.D.

Winsor, T., and Burch, G. E.: Renal Complications Following Sulfathiazole Therapy. *J. Am. M. Ass.*, 1942, 118: 1346.

In view of the relatively few reported instances of renal damage by sulfathiazole in man, the indiscriminate use of the drug by many, and the possibility that most patients who receive the drug are not properly studied for evidences of renal changes, it was considered warranted to report 6 cases in which renal injury developed following the administration of sulfathiazole. These 6 cases illustrate some of the renal problems encountered from the therapeutic use of sulfathiazole.

The diagnosis of renal damage is not difficult, especially if the patient has been properly studied and an inventory of the renal state has been taken before sulfathiazole was administered. The appearance of hematuria, oliguria, backache, tenderness over one or both kidneys, decreased renal function, azotemia, and progressive nephromegaly in a patient who has received sulfathiazole should make one suspect renal damage from the drug. Rarely do all the findings exist at the same time. Cystoscopic study will usually establish the diagnosis. Sulfathiazole crystals in the urine may aid in establishing the diagnosis, but their presence alone does not mean renal damage. X-ray study will usually not reveal uroliths unless there is calcification, which is rare. It should be remembered that renal damage can occur in the presence of a low blood level of sulfathiazole and also after only a small amount of the drug has been administered.

Because of the tendency of sulfathiazole to injure the kidneys, it is necessary to employ the drug cautiously. On administration of the drug it is advisable to follow certain rules:

1. Determine whether or not the patient has had any sulfonamide medication before. If the history is not reliable, it is advisable to determine the blood level and prescribe accordingly. This will tend to prevent overdosage.

2. Evaluate the state of the patient's renal function and the nature of the urine being excreted before administering the drug. In the presence of impaired renal function there is a greater chance for overdosage and renal damage. Furthermore, infectious states for which the drug is used will in themselves produce renal changes with casts, erythrocytes, and albumin in the urine. It is therefore necessary to know whether or not findings in the urine following the use of sulfathiazole are due to the drug or to previously existing infection. In the presence of serious renal damage proceed carefully with the drug, check the urine frequently, and determine the blood sulfathiazole level often. Should hematuria develop or renal function definitely decline, stop the drug immediately. Do not allow the blood levels of the drug to increase above therapeutic values. In some instances it might be well to determine the blood levels of urea nitrogen or total nonprotein nitrogen before giving the drug to patients who have some evidences of impaired renal function determined by urea clearances, concentration tests, and the like. Palpate the kidneys before and during the use of the drug.

3. The hydration of the patient should be evaluated. A severely dehydrated patient will take in a great deal of fluid and excrete but little and therefore will be more likely to experience renal damage.

4. There is some disagreement among observers as to the influence of the pH of the urine on the incidence of the renal damage. Since some believe that an alkaline urine tends to reduce crystal formation, and if the use of alkalis and an alkaline urine are not contraindicated in a particular case, it would be well to administer alkalis and maintain an alkaline urine.

5. Guard against allergy, hypersensitivity, and idiosyncrasy. If no unfavorable reactions result in twelve hours after giving about ⅓ gm. of the drug by mouth treatment may be continued.

Treatment consists of alkalization, diuresis with large quantities of fluid, and, if necessary, hypertonic solutions of dextrose, ureteral catheterization, and irrigations with warm (107 degrees) distilled water.

These patients should be followed up and careful studies should be made from time to time to make sure that there is no residual or latent damage which may become manifest as a chronic disease later.

CHARLES BARON, M. D.

Newman, H. R., and Shleser, I. H.: A Sulfonamide Renal Calculus Surgically Removed Two Years After the Administration of Sulfapyridine. *J. Urol.*, 1942, 47: 258.

There have been numerous reports of the precipitation of acetylsulfapyridine crystals in the kidney as a result of sulfapyridine therapy, but most of the articles have indicated that these sharp-edged crystals which form in the tubules will redissolve and wash out if an adequate fluid intake is maintained. However, it has also been shown that if precipitating factors are brought to bear, such as concentration of

the urine, trauma, or mechanical obstruction at the ureteropelvic junction, due to either intrinsic or extrinsic causes, then any one of these will favor the collection of sulfapyridine crystals to form a conglomerate mass which cannot be painlessly passed as sediment, but will give rise to puttylike uroliths. These masses increase in size and may go on to produce definite renal impairment. This formation of calculi with the associated interference in kidney function is one of the most serious complications that follow the administration of this drug. In view of the thousands of patients who have received such treatment without further investigation or follow-up once the acute infection has subsided, it becomes interesting to speculate on the belated effects of such therapy.

A white woman, thirty-eight years of age, was readmitted to Long Island Hospital for convalescent care two years ago, following recovery from a severe attack of lobar pneumonia. The patient had been confined to her bed for a period of six weeks and had received large doses of M and 693 (dagenan) and prontylin. During the experimental administration of this drug in January, 1939, frequent urinalyses revealed no evidence of red blood cells or sulfonamide crystals in the sediment. Following the patient's return to this hospital, she remained in her usual health until June, 1939, when she began to complain of repeated attacks of pain in the right lumbar region.

X-rays revealed a large shadow indicative of renal calculus in the right kidney area. The interpretation of the films obtained by retrograde ureteropyelography was a moderate degree of right hydronephrosis with obstruction at the ureteropelvic junction due to extrinsic pressure and renal calculus in the right kidney pelvis.

Urinalysis showed innumerable white blood cells; cultures revealed the bacillus proteus. Chemical examination of the blood showed no nitrogen retention. A catheterized specimen from the right kidney showed numerous white blood cells and occasional red blood cells; cultures revealed the bacillus proteus.

The right kidney and ureter were exposed by a modified hockey-stick incision. An enlarged kidney with a moderately dilated pelvis was found; it was due to compression by 2 aberrant vessels and bands which encircled and obstructed the ureteropelvic junction. The vessels were ligated and cut, and the stones removed from the pelvis of the kidney by pyelotomy. The ureter was splinted by means of a ureteral catheter.

The ureteral catheter and pyelotomy tube were irrigated daily with a 1 per cent solution of phosphoric acid. The catheter was removed at the end of seven days and the pyelotomy tube at the end of ten days, at which time the patient's temperature was normal. The urine continued to show a few pus cells and on the fourteenth day the temperature was markedly elevated. Cystoscopy was repeated. A ureteral catheter evacuated a moderate-sized right hydronephrosis. The catheter was allowed to remain in position for forty-eight hours, following which the temperature returned to normal. The patient was allowed up on the nineteenth day and she then made an uneventful recovery.

The stones were of the earthy type and crumbled easily on slight pressure. Chemical analysis revealed large quantities of sulfonamide intermixed with protein, some magnesium ammonium phosphate, and a trace of calcium carbonate, which explained the roentgenological visualization.

JOHN A. LOEF, M.D.

Hamm, F. C.: Wilms' Tumor in a Sixty-Four-Year-Old Male. Report of a Case. *J. Urol.*, 1942, 47: 403.

Twenty-five cases of Wilms' tumor occurring in the adult are reported in the literature. The author reports herewith another case bringing the total to 26. The rarity of Wilms' tumor in the adult makes this case noteworthy.

Adenosarcoma of the kidney was described by Wilms in 1899 and since then has been commonly referred to as Wilms' tumor. This tumor is extremely malignant. Less than 5 per cent of children afflicted survive five years. There is no reported survival of an adult.

A sixty-four-year-old male was first admitted to the hospital with the chief complaint of hematuria of six weeks' duration. Previously the hematuria had been intermittent with the occasional passage of small clots. However, for a few days prior to admission bleeding was continuous and profuse. On physical examination the abdomen was moderately distended and the musculature was relaxed. A mass about 8 by 10 cm. in size, thought to be retroperitoneal, was found in the right upper quadrant. It was hard, nodular, slightly tender, and moved on respiration. Urinalysis revealed red blood cells in such large numbers that they could not be counted. A cystoscopic examination on the third hospital day showed a fairly large median bar and trabeculation of the bladder. Both ureteral orifices were in normal position. Bloody spurts were seen to come from the right meatus, but clear urine from the left. A grossly hemorrhagic specimen of urine was collected from the right and a clear specimen from the left kidney. Following an intravenous injection of 1 cc. of phenolsulfonphthalein, none was recovered from the right kidney. A plain roentgenogram showed that the catheters were well up in the renal pelves. The right renal area was seen to be occupied by a large, ovoid mass about 10 by 20 cm. Bilateral pyelograms indicated that the renal calyxes, pelvis, and ureter were normal on the left side. On the right side there was a blocking off of the lower calyxes, the upper calyx being indistinct and feathery in outline. A right nephrectomy was performed through a loin incision. The renal mass was easily mobilized. There was no evidence of infiltration of the perinephric tissues. The ureter was not dilated. The patient tolerated the procedure well.

Approximately the entire lower half of the kidney was replaced by a tumor which infiltrated the capsule and perirenal fatty tissue. There was, however, a pseudoencapsulation of the tumor. On section the upper portion of the kidney was found relatively normal in appearance. Remains of several calyxes were dilated and tumor tissue had invaded the lining of the calyxes. The remains of a portion of the main pelvic cavity were compressed by tumor tissue and obstructed to a high degree. The proximal 6 cm. of the ureter were distended by a mass composed partly of tumor and partly of clotted blood. The main mass of tumor in the lower pole was greyish white and soft and friable.

On microscopic examination the predominant cells were large spindle cells arranged in coarse interlacing bundles. The nuclei were elongated and vesicular. There was abundant cytoplasm containing vacuoles. These cells were moderately anaplastic. Focally, epithelial structures were present. These formed cords, small acinar clusters, and occasional acini. Their nuclei were small and rounded or oval, while the cell bodies were of a foamy pale-staining appearance. The tumor was interpreted as a mixed tumor containing carcinomatous and sarcomatous structures, the latter being probably derived from muscular tissue.

The patient was discharged from the hospital. One month later he had gained 4 lb. and felt pretty well. At this time it was considered advisable to wait until he was in a still better physical condition before deep roentgen-ray therapy was begun. However, three weeks later, he showed no further improvement. His pulse was 96 and his hands were cold. There was weight loss and evidence of anemia. He was seen again in two weeks. From this time on the clinical course was downward. Two months following his discharge, the patient was readmitted to the hospital. There was increasing loss of weight, weakness, cachexia, anorexia, and constipation. On physical examination a large mass was found in the right flank and along the incision. It was believed to be a recurrence of the tumor. A roentgenogram of the chest was suggestive of an infiltration in the right lung. The patient ran a progressively downhill course with anorexia and weakness until death intervened on the fourteenth hospital day. JOHN A. LOEF, M. D.

Weisel, W., and Dockerty, M. B.: Adenocarcinoma and Fibrosarcoma in the Same Kidney. Report of 2 Cases. *J. Urol.*, 1942, 47: 410.

Adenocarcinoma and fibrosarcoma occurring as separate entities in the same kidney are rare, although it has been frequently noted that undifferentiated cells of renal carcinoma may simulate sarcomatous elements. The following cases are 2 in which adenocarcinoma and fibrosarcoma of the same kidney were found:

CASE 1. A man aged forty-eight years complained of gross hematuria. The patient had been well until two months previously, when, while working in the field, he had experienced urinary urgency and had passed grossly bloody urine and a blood clot. Pain had been absent, but hematuria had persisted for twenty-four hours. Six days after this initial episode, he had had a sudden onset of severe pain in the right lower quadrant of the abdomen, which had been relieved by cold applications. After this attack he had noted recurrent episodes of gross hematuria without colic every seven to ten days; between these episodes he had observed that his urine had remained slightly bloody and cloudy.

A month prior, pain and tenderness had developed in the right lower quadrant of the abdomen and a gangrenous appendix had been removed. Convalescence had been uneventful, but hematuria associated with frequency of urination (every two hours), dysuria, and the passage of blood clots continued.

Physical examination revealed a loss of 30 pounds. Examination of the abdomen disclosed a recent scar over the right rectus muscle, and a large movable mass in the right portion of the abdomen about the size of a large orange. The specific gravity of the urine was 1.020; the urine was acid in reaction and contained albumin Grade 2 and erythrocytes Grade 4; pyuria, Grade 3, was present.

An excretory urogram revealed obstruction at the right ureteropelvic junction.

At surgical exploration, a large renal neoplasm was found, on the right side, which was especially extensive in the region of the lower pole. Nephrectomy was performed, and the tumor proved to be an adenocarcinoma of the hypernephroma type, Grade 3, which had been growing at the lower pole. Convalescence was uneventful, and the patient was dismissed from the hospital and clinic following a course of irradiation.

The patient felt improved in health for two months, after which time he began to lose weight and experience anorexia, chills, and cough; although hematuria, frequency, nocturia, urgency, and dysuria were absent. Five months after operation, severe pain and soreness developed in the right testis; he also noticed a mass in the right side. Because of these difficulties he returned to the clinic. Physical examination at this time revealed a tender mass in the lower right quadrant of the abdomen.

At operation, a small piece of tissue was removed from the mass in the right loin, which appeared to be retroperitoneal. Pathological examination disclosed this to be a sarcoma, Grade 4. Recovery from this procedure was uneventful and the patient was dismissed.

Because of the sarcomatous nature of the recurrent mass, it was conceded that 2 possibilities existed in regard to the etiological factors of the neoplasm, namely, (1) that the original tumor was unusual in that it contained carcinomatous and sarcomatous elements, or (2) that the sarcoma represented not a recurrence but an independent neoplastic process. In order to determine which assumption was correct, the original specimen was carefully restudied in its gross details. The tumor was lobulated and was 10 cm. in diameter; the greater mass had been in the

lower part of the kidney. In general, the outer surface of the tumor was poorly encapsulated and at some points there was evidence of extrarenal extension. On its cut surface, the tumor appeared for the most part yellow, similar in appearance to a hypernephroma. However, small, brownish multicentric nodules were seen near the capsule which were firmer in consistency than the surrounding tissue of the tumor.

Microscopic examination of the yellowish portions of the tumor revealed an adenocarcinoma of the hypernephroma type, Grade 3. On the other hand, the brownish nodules presented the picture of a sarcoma, characterized by embryonic spindle cells which contained large, hyperchromatic nuclei and malignant-appearing nucleoli (so-called one-eyed cells).

CASE 2. A man sixty-eight years of age complained of pain in the left portion of the abdomen and hematuria. He had been in good health until seven years prior, at which time he had experienced severe pain of a colicky nature in the left renal region with extension to the left groin, penis, and left leg. This attack had been associated with gross hematuria and had lasted about one week. He was well after this episode, however, until a year previously, when the abdominal colic and hematuria had recurred. These attacks had occurred every day and hematuria had become more pronounced. In the six months he had lost 50 pounds.

Physical examination revealed a plethoric, ill-appearing man, with a large mass in the left upper portion of the abdomen; the blood pressure in millimeters of mercury was 168 systolic and 90 diastolic. The temperature was 99°F., the pulse rate 104, and respirations numbered 20 per minute. The value for hemoglobin was 17.3 gm. per 100 cc. of blood; the erythrocytes numbered 6,150,000, and the leucocytes, 5,700 per cubic millimeter of blood. The volume index was 0.97, and the value for urea was 38 mgm. per 100 cc. of blood. The specific gravity of the urine was 1.012. The urine was acid in reaction and contained albumin, Grade 1 plus. Sugar was absent and occasional leucocytes were found in the urinary sediment.

Left nephrectomy was performed. Pathological examination of the kidney revealed adenocarcinoma of the hypernephroma type, Grade 2, associated with a fibrosarcoma, Grade 3. The sarcoma apparently originated in the capsule, but in places it intermingled with the adenocarcinoma.

The patient died of circulatory collapse postoperatively. At necropsy, residual sarcoma of the perirenal tissue, renal vein, peritoneal cavity, and metastasis to the lungs were found; a small adenocarcinoma of the hypernephroma type was found in the right kidney.

The tumor was fairly diffuse and involved the entire kidney; the kidney weighed 1,675 gm. Large yellow areas on the cut surface of the tumor were interspersed with brownish, nodular zones. Although these zones were concentrated near the capsule, they were, nevertheless, also more centrally located. All yellowish zones observed microscopically presented the picture of an adenocarcinoma of the hypernephroma type, Grade 2. By contrast, as with the tumor in Case 1, the brownish nodules demonstrated the picture of a fibrosarcoma, Grade 2, composed of spindle cells arranged in sheets, with a fair attempt at maintaining polarity. JOHN A. LOEF, M. D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Miyakawa, G., and Stearns, G.: Severe Osteoporosis (or Osteomalacia) Associated with Long-Continued Low-Grade Steatorrhea. *J. Bone & Joint Surg.*, 1942, 24: 429.

When calcium absorption is restricted in adults a general rarefaction of the skeleton takes place. This is seen in pregnancy with insufficient calcium intake, starvation osteomalacia in families during war time, and in idiopathic steatorrhea.

A case of the latter is presented by the authors; there was an adequate diet intake but the patient suffered from an intermittent diarrhea for several years. There were generalized pains, progressive kyphosis, pseudofractures of the ulnas, progressive weakness, amenorrhea, and extreme loss of weight. The first impression was that of an ankylosing spondylitis, and a body brace was applied. No improvement was noted after several years and the patient was admitted to the hospital for study.

The urinary excretion of calcium was only one-tenth normal, but the fecal samples of calcium equalled the intake and the patient's fecal fat was twice the normal amount. The low-grade fat deficiency accounted for the poor calcium absorption and the poor absorption of the fat-soluble vitamins, notably Vitamin D. The Vitamin A intake was normal, as measured by the dark-adaptation tests.

The patient was placed on a diet of 1½ qt. of milk daily, 1,200 units of Vitamin D; 5 gr. of bile salts and pancreatin, thrice daily; and calcium lactate (10 gr.), thrice daily. The prescribed diet was low in fat content. The patient improved rapidly, gained weight, and her menses returned. The phosphatase value, though still high, was only half its former value, and fecal excretion of calcium diminished markedly. All therapy was then discontinued except for the milk and Vitamin D intake, but it was noted that fat excretion increased to three times its former level and the patient was returned to the regime of pancreatin-bile-salt-calcium therapy. On this regime he continued to do well.

A case in which steatorrhea was almost symptomless developed severe osteomalacia because of the chronicity of the condition. Regulation of diet alone was able to cause considerable improvement even as regards the amenorrhea, and endocrine therapy was not employed. Therefore, in cases of idiopathic osteoporosis, the inability to digest fat should be investigated. DANIEL H. LEVINTHAL, M.D.

Donhauser, J. L., and DeRouville, W. H.: Multiple Myeloma, with Special Reference to Soft-Tissue Metastasis. *Arch. Surg.*, 1941, 43: 946.

This article is a rather thorough summary of our present knowledge of this disease and includes complete clinical, roentgenological, and autopsy data on 5 cases. Three patients were males and 2 females. Their ages varied from twenty-four to sixty-two years, 3 being in the sixth or seventh decade. Bence Jones protein was found in the urine of 3, but the urine findings were not constant. Careful study of roentgenograms may be necessary for early diagnosis, and an elevated blood phosphotase level indicates pathological bone changes. Metastases were present in 3 cases. Low blood pressure was found in only 2. Pain in the back was the presenting symptom in 4 of the cases, and this complaint should always suggest the possibility of multiple myeloma, especially in the sixth decade of life.

CHESTER C. GUY, M.D.

Coley, B. L., and Miller, L. E.: Atypical Giant-Cell Tumor. *Am. J. Roentg.*, 1942, 47: 541.

After briefly describing the characteristics of typical giant-cell tumors, the authors state that distinctly atypical cases are rarely encountered. They may be divided into two groups: (1) atypical because of clinical and pathological criteria, and (2) atypical because of location.

In the first group are those giant-cell tumors that are malignant at the time of first observation, the diagnosis being based on a study of tissue removed prior to the administration of any form of treatment; and also those tumors that are believed to have undergone a malignant transformation following unsuccessful treatment, i.e., curettage, irradiation, or both.

In the second group is found that rare example of an expanding osteolytic lesion involving the shaft of a long bone rather than the extremity. The roentgenographic appearance does not simulate that of a malignant tumor, although, from its location, a benign giant-cell tumor is not suspected. Under conservative surgery or irradiation this lesion responds in the manner of a giant-cell tumor, and sections of tissue are so diagnosed by the pathologist.

The importance of recognizing these atypical giant-cell tumors is obvious for proper treatment. Several case histories of examples of such tumors are cited with roentgenograms illustrating them. Attention is also called to Codman's epiphyseal chondromatous calcifying giant-cell tumor and a typical example of it is included in the case reports.

A. HARTUNG, M.D.

Foisie, P. S.: Volkmann's Ischemic Contracture. *N. England J. M.*, 1942, 226: 671.

Since 1871, when von Volkmann first described the contracture deformity that bears his name, it has all too generally been accepted as a complication of the improperly treated supracondylar fracture of the humerus. This article presents evidence that Volkmann's ischemic contracture has no essential con-

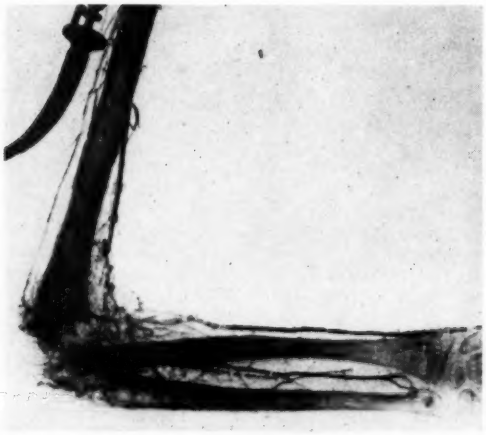

Fig. 1. Arteriographic study in a case of Volkmann's contracture. Note the segmentary spasm of the lower end of the brachial and the upper ends of the radial and ulnar arteries (Leveuf).

nection with such a fracture or any other specific injury but is the result of ischemic infarction produced by segmentary arterial spasm of the main artery to an extremity, with reflex spasm of the collateral circulation. Thus, a subtotal ischemia is produced, and the muscle bellies, which have the greatest demand for arterial blood and are therefore the most vulnerable tissue to its loss, are the first affected. Gangrene of the fingertips or partial or even complete gangrene of the extremity would result if this spasm continued in sufficiently severe degree, but when Volkmann's contracture is to be the only result, some improvement in the arterial supply intervenes. This vasomotor activity is under control of the sympathetic nervous system.

Only the acute stage of Volkmann's contracture is concerned in this study. Whatever one may believe to be the responsible factors, the lesion initially is one of impaired circulation. In the old cases of established deformity, normal blood supply has returned, and the problem is entirely one of correcting existing deformity by physical therapy; tendon lengthening, and bone shortening.

The goal of treatment is to restore adequate circulation before irreparable damage is done, and thus to avert contracture deformities.

In the literature, 30 case histories were reviewed, and findings of the various operators were strikingly similar. The antecedent injury was usually a fracture or bullet wound of the upper arm. In about twenty-four hours definite signs of ischemia appeared: the hand became cold and swollen, with usually a pale cyanosis, and the fingers became functionless. Pain was a prominent symptom, especially on any attempt at motion of the fingers, either active or passive. The radial pulse was absent. If the condition was further observed, the next day the fingers usually assumed a position of flexion, and any attempt to straighten them caused considerable pain. When apparatus was used to maintain extension of the fingers, the patient could not tolerate it for long, even with repeated doses of morphine, and it invariably had to be removed. In these cases, the surgeon, after intervals varying from twenty-four hours to three weeks, finally decided to explore the injured site. In every case a profound segmentary arterial spasm was encountered. Usually at a point about 2 cm. above its bifurcation, the brachial artery was pulsating normally, was even perhaps a little dilated, but there it suddenly became narrowed to a string-like size extending down into the radial and ulnar branches.

Although arterial spasm of varying degrees has been recognized in many peripheral vascular disorders, it has not until very recently been suspected of being responsible for such severe ischemia, and this series of cases establishes arterial spasm as a phenomenon to be reckoned with.

The pathological change is essentially an atrophy of the flexor muscle bellies; whole destruction results in an apparent shortening of the flexor tendons, which pulls the fingers and sometimes the wrist into acute flexion.

The gross picture, which is one of central degeneration of the muscle bundle, is duplicated histologically by only one other condition, infarction. The most extensive degeneration occurs in the center of the muscle sequestrum, and cellular activity and fibrosis take place only at the periphery, which is surrounded by a sheath of dense fibrous tissue. In the center of the mass, the muscle fibers lose their nuclei and cross striations, and fuse into a homogeneous mass,with little more than a defining membrane separating them. As the periphery is approached, some signs of function are preserved, and there is an area of intense cellular activity, both fibroblastic and phagocytic. This picture is in contrast to muscle degeneration from all other causes, such as denervation and sepsis, in which the appearance is one of diffuse interfibrillar fibrosis. This histology should be kept in mind when one considers the mechanism of the ischemia. It is also of value in animal experimental work in determining whether or not a true Volkmann's contracture has been produced.

In discussing the etiology the author states that injury need not directly affect the vessel to produce arterial spasm. A detailed case report is presented to demonstrate this.

Sometimes, segmentary spasm is produced by minor injury to the arterial wall that is not sufficient to occlude the artery by the damage *per se* but causes the artery to occlude itself.

Arterial spasm is also seen following lodgment of emboli, and in fact may result from any disturbance of the peripheral circulation.

It is evident that good collateral circulation is capable of amply supplying all the needs of the peripheral tissues, and that the chief danger in cases of

main-artery occlusion lies in the degree of constriction or dilatation of the collaterals that are under sympathetic vasomotor control.

In treatment time is a major factor. This syndrome is a progressive one in which more and more damage is done. The value of early action is apparent. All measures favoring circulation generally are of fundamental value. These include elevation of the part, removal of any apparatus or circular bandaging, and the application of mild external warmth.

The next logical step is the interruption of the sympathetic reflex arc. Theoretically, one might expect to accomplish this by ganglion injection, periarterial sympathectomy, or arteriectomy. Ganglion block, which is the simplest of these methods, should be tried first. Its results will be apparent at once, and if the procedure is successful, an open operation is avoided.

Lumbar block is now a common procedure when peripheral dilatation is desired, and needs no further comment. Injection of the stellate ganglion is perhaps not so familiar. The appearance of the Bernard-Horner syndrome within a few minutes is evidence of successful cervical sympathetic paralysis.

The possibility that local arterial spasm may be the result of a local reflex that does not include the paravertebral ganglions means that this procedure cannot be expected to be universally successful; if circulatory improvement is not promptly apparent, or if initial improvement is not maintained, the artery should be exposed.

This at once accomplishes effective relief of any abnormal venous pressure, determines whether any local trauma to the artery has been sustained, and affords opportunity for complete sympathetic-arc interruption by periarterial sympathectomy or arteriectomy.

Concerning the respective values of these two procedures, there is some difference of opinion among those surgeons who have had some experience in their use. In the series of 30 cases mentioned, arteriectomy by the removal of from 3 to 5 cm. of the contracted artery with simple ligation of both free ends was performed in 10, periarterial sympathectomy in 5, and various procedures in the remainder, including freeing-up of the artery, novocaine injection, ligation, and simple loose closure. The arteriectomy group invariably gave the best results. Definite improvement of the circulation resulted in every case, with complete return of the normal circulation and function in most cases.

Arteriectomy may appear to be a radical procedure, and a natural reaction is to try to save the artery and hope to re-establish function of this blood-carrying channel. Objections to this are that the alternative periarterial sympathectomy on an extremely contracted artery may be technically difficult, and that interruption of the sympathetic control is the main goal in view. Arteriectomy has the advantage of complete interruption of the reflex, in addition to the removal of a segment of artery that possibly contains a small break or tear, not grossly visible, but sufficient to maintain continued abnormal sensory stimuli.

Arteriectomy affords all the elements of completely rational treatment because it removes a segment of artery that is not contributing to the circulation but is a source of abnormal sensory impulses, and because it completely interrupts the sympathetic reflex arc both centrally and locally, and thereby most effectively produces vasodilatation of the collaterals.

ROBERT P. MONTGOMERY, M.D.

Watkins, A. L.: Electromyograms in the Diagnosis and Prognosis of Tetanus. *J. Am. M. Ass.*, 1942, 119: 261.

In the absence of trauma the diagnosis of tetanus is easily overlooked, and even in the presence of an infected wound and obvious "lock-jaw" the bacteriological studies may be negative. Tetanus toxin is known to act on the skeletal muscle; it causes contracture as a characteristic manifestation. In local

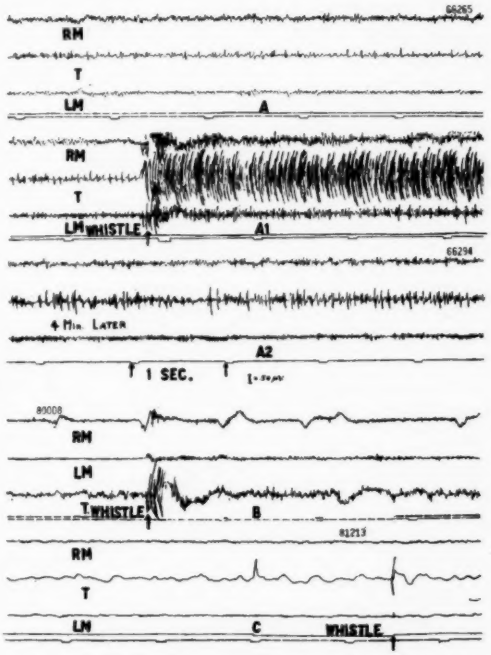

Fig. 1. Electromyograms in tetanus: A, A1, and A2, tracings before treatment. A, Continuous electrical activity in affected muscle with maximum relaxation. A1, decided increase in voltage after whistle is blown near patient. A2, Slight increase in voltage persisting four minutes later. B, Sixteen days later, moderate discharge at rest only slightly increased by whistle. C, Three months later, no electrical activity at rest or after whistle as in any normal muscle at rest or after whistle. Time intervals and calibrations are the same in all tracings. R M indicates right masseter; L M, left masseter, and T, right trapezius.

tetanus produced experimentally the action potentials of affected muscles have been shown to present constant activity with diphasic spikes. This abnormal electrical activity is a specific effect induced by tetanus toxin and when demonstrated is of diagnostic value.

In a case of suspected tetanus of obscure origin, electromyograms were taken from the affected muscles and a test devised to estimate the abnormality present for the purpose of prognosis and to aid in following the progress of the disease.

Bacteriological studies were not helpful, the only specific evidence of tetanus toxin being the presence of muscle contracture and the abnormal electromyograms. An increase of electrical activity following the whistle test suggested that the central nervous system was affected as well as the muscles locally, and indicated a more serious prognosis. To test for the presence of generalized tetanus, the effect of an external stimulus on the degree of spasm was determined by blowing a whistle near the patient. This definitely increased the voltage of the action potentials, although no change was observed clinically. The voltage of this abnormal electrical activity and the response to an external stimulus gave an objective quantitative index of the extent of local and general action of the toxin and a sensitive guide as to progress.

The diagnosis of tetanus in the average case can be readily made on clinical grounds alone, but the electromyograms may prove of value in an obscure case, as in this instance. Although action potentials have been recorded from experimental tetanus, the author has found no previous report of electromyograms from a patient with this disease.

ROBERT P. MONTGOMERY, M.D.

Horwitz, T.: Dupuytren's Contracture; a Consideration of the Anatomy of the Fibrous Structures of the Hand in Relation to This Condition, with an Interpretation of the Histology. *Arch. Surg.*, 1942, 44: 687.

Most of the theories relating to the causation of Dupuytren's contracture appear to have been founded on wholly inadequate evidence. The importance of such factors as trauma, chronic specific or nonspecific inflammatory processes, circulatory stasis, toxins (focal infections, gout, diabetes mellitus, arthritis), embryological malformations, peripheral or central neurological disturbances, and endocrinopathies has not been substantiated by a critical analysis of the clinical and histological material in this investigation and of the data reported by other writers.

Certain other factors, however, do appear to have some significance:

Heredity. The occurrence of Dupuytren's contracture in several generations in the same family and the high familial incidence in large series of cases have been noted by numerous authors.

Senility. The contracture occurs most frequently in middle life and in old age. It is not unlikely that this fact may be related, at least in part, to the presence of such degenerative and proliferative processes as were noted in this study in the vascular and connective tissues of normal palmar fascias in patients in the later decades of life.

Fibroblastic diathesis or predisposition. The theory of a constitutional predisposition to connective-tissue proliferation has been suggested by some observers because of the concomitant occurrence in some cases of Dupuytren's contracture, of thickening and contracture of the plantar fascias and of induration of the penis. There is a striking histological resemblance of the fibroblastic process in Dupuytren's contracture to other localized fibroplasias, such as keloid and fascial desmoid. A keloid is a localized overgrowth of hyaline connective tissue developing in the skin of a predisposed person, usually at the site of scarring, although it may arise spontaneously. A desmoid is a fibroma of the abdominal wall. Although the relation of desmoids to trauma (e.g., from gestation) cannot be overlooked, the congenital origin of some and the origin of many others in the scars of uncomplicated laparotomy suggest an anatomical predisposition of the affected tissue to desmoid formation in certain subjects. Furthermore, like Dupuytren's contracture, both keloid and fascial desmoids are prone to recur despite extensive surgical excision.

This study of Dupuytren's contracture embraces: (1) the normal gross anatomy of the human palmar fascia (material: 60 hands); (2) the microscopic anatomy of the palmar fascia in human cadavers presenting no gross abnormality of this structure (material: 27 specimens); (3) the histological features of Dupuytren's contracture (material: 35 cases).

The deformity in Dupuytren's contracture was found to be intimately related to the gross anatomical structure of the fascial layers and septums of the hand. Widespread surgical excision of these tissues is essential to effect and maintain correction of the deformity.

The tendonlike structure of normal palmar fascia and the proliferative and degenerative changes which occur in this tissue with advancing years may have some bearing on the development of fibrosis of the palmar tissues in Dupuytren's contracture—a condition which is most prevalent in the later decades of life.

The essential process in Dupuytren's contracture is benign fibroplasia of the palmar connective tissues. Inflammatory features are not constant, nor is there evidence that the proliferative process arises from the walls of the blood vessels. The histological features and the clinical behavior of this fibroblastic process bear a striking resemblance to those of other localized fibroplasias, such as keloid and fascial desmoid.

Such factors as heredity, senility, and fibroblastic diathesis or predisposition appear to be of importance in the causation of Dupuytren's contracture.

Photomicrographs accompany the article.

ROBERT P. MONTGOMERY, M.D.

Phalen, G. S., Prickman, L. E., and Krusen, F. H.: Brucellosis Spondylitis. *J. Am. M. Ass.*, 1942, 118: 859.

In 2 of the 3 cases of brucellosis spondylitis presented, destructive lesions of the spinal column were present, and in 1 the clinical signs and symptoms of acute spondylitis without any significant bony changes were observed. All the patients recovered, with demonstrable repair of the bony lesions in 2 cases, after they had received a course of physically induced hyperpyrexia. The procedure arbitrarily employed at the Mayo Clinic in the administration of this treatment is as follows:

Three sessions of fever are given, separated by an interval of three days and with a sustained rectal temperature from 105 to 106° F. (40.5 to 41.1° C.) for five hours; the patient is kept in the hospital during the period of treatment.

The diagnosis in the 3 cases reported is based chiefly on the presence or history of remittent fever, the local signs and symptoms of spondylitis, and a high titer of specific agglutinins for brucella organisms in the patient's blood. That spondylitis in these 3 cases was caused by the brucella infection is more or less proved: first, by the fact that prompt remission of the symptoms of spondylitis occurred in each case following fever therapy; second, by the fact that this therapy has been shown to be effective in most cases of brucellosis, without bony lesions, in which the patients have been so treated at the clinic. Furthermore, evidence that the organisms of brucellosis were present in the 3 cases presented is adduced by negative exclusion: physically induced hyperpyrexia has not been effective in control of the symptoms of the common forms of spondylitis, either the atrophic or hypertrophic types, in which the organisms of brucellosis are not the cause.

On the basis of the small series of cases reported it could not be stated that employment of fever therapy hastens the healing of pathological lesions in the spinal column in the condition under consideration; but certainly, the great diminution in the extent of pain in the back and the lessening of the paravertebral muscular spasm following this treatment would lead to the conclusion that the infectious process was at least arrested by such therapy. The prompt relief which immediately followed the fever treatment in each of these 3 cases could scarcely be said to have been the result solely of coincidental spontaneous remission.

FRACTURES AND DISLOCATIONS

Smith, D. J. N.: Treatment of Fractured Ribs. *Brit. M. J.*, 1942, 1: 383.

It is the author's contention that the usual routine method of treating simple fractures of the ribs by extensive strapping of the chest wall is most unsatisfactory. Relief from pain does occur to some extent but it is never complete, and the strapping sometimes proves uncomfortable, irritating, and sticky, becoming well-nigh intolerable in a few days.

He does not believe that the strapping is very effective for immobilization. Occasionally immobilization of the chest wall results in insufficient aeration of the underlying lung which may be serious in elderly patients, who are frequently confined to bed.

Chest pain is due to full inspiration or to coughing. Smith believes that there are two different pains in the case of fractured ribs. One is a constantly present dull ache not localized exactly to the fracture, but extending upward and downward two or three spaces, and backward and forward some distance. This pain, he believes, is due to the bruising of the tissues (including the bone). The other is a sharp stabbing pain produced by deep breathing and coughing, which may be caused by muscular spasm. There is also the possibility of involvement of the intercostal nerve, which may be pressed upon by a localized hematoma, or caught between the bone ends.

The author has treated about a dozen cases of simple fractured ribs by the injection of about 7 cc. of percaine (1:1,000) in and around the fracture. All responded with relief of the pain, except, that in 3 cases the injection had to be repeated once, one or two days later, and in 1 case 3 injections had to be given over the period of a week. In the treatment of these dozen cases he did not find it necessary to resort to an oily local anesthetic solution; however, he believes that the disadvantage of frequent injections could be overcome by the use of injections of such oily solutions.

The technique of the injection method is given.

E. C. Robitshek, M.D.

ORTHOPEDICS IN GENERAL

Hutchison, J. H.: Nonarticular Rheumatism in the Army. Symptomatology, Etiology, and Treatment. *Glasgow M. J.*, 1942, 137: 33.

The frequency of rheumatism in the British Army is comparatively much less than in civil life. The nonarticular forms, e.g., fibrositis and sciatica, are the most common. Osteoarthritis is rarely seen because of the youth of the patients presented in this group. Of all cases of rheumatism seen by the author in one given hospital (approximately 60 over a period of seven months) three-quarters fitted into the fibrositis group. Fibrositis commonly affects the fibrous tissue of the neck, trapezius muscles, lumbar and sacroiliac areas, gluteus and hamstring muscles, and intercostal muscles. The outstanding complaints are pain and stiffness. Objective findings are little, which gives opportunity to the malingerer. There should usually be two or three signs present—well defined tenderness, spasm, and nodule formation. The average hospital stay in these cases was twenty days and every patient observed returned to duty. Thus, when properly diagnosed and treated, fibrositis should rarely be a case of prolonged invalidism.

The author differentiates true sciatic neuritis from referred sciatic pain by one or more signs, such as

absence of the ankle jerk, wasting of the musculature of the extremity on the affected side, and anesthesia of the lateral aspect of the foot.

As to the etiology of fibrositis, sudden strain, continued heavy work, minor dental infections, and psychological factors are in the foreground. Patients who have had an attack of fibrositis caused by psychological factors and are treated with success will still complain of pain as a protection from an unpleasant future situation. Such a situation is remediable by an early return to full duty, once the organic basis of the symptoms is removed. Treatment consists of rest, heat, skilled massage, drugs, and the injection of local anesthetics. Unskilled massage must be avoided as the cure may be far worse than the disease in the hands of an overenthusiastic novice. The results of the injection treatment may be dramatic. It is of great diagnostic aid in pain of psychogenic origin.

LEO MARKIN, M.D.

Turner, R.: The Treatment of Fibrositis by Local Injection. *J. Roy. Army Med. Corps*, Lond., 1942, 78: 77.

Myositis, fibrositis, or muscular rheumatism may be manifest in various skeletal structures, and the pain and disability produced are familiar to everyone.

Fibrositis is especially common in those who are rheumatic subjects constitutionally and often by inheritance. Exposure, chill, and a general lowering of resistance from any cause play their parts. Probably some degree of infection is always a factor but it may be difficult to demonstrate. Trauma is a precipitating factor in other cases, as exemplified by the patient who is seized with acute pain in the back while bending down or lifting a weight.

The recent experimental work of Lewis and Kellgren is important and instructive. Using some irritant solution such as hypertonic saline solution they have been able to reproduce a type of pain identical with that of patients suffering from fibrositis of the kind described in this article and to relieve it in the same way. They have been able to map out areas of referred pain and show how these vary with superficial or deep lesions. Moreover localization is more accurate with superficial lesions, while deeper ones are accompanied by characteristic though more diffuse referred pain.

The chief symptom is pain and the chief sign is localized tenderness. The onset is usually sudden or rapid. Occasionally pain comes on gradually and then gets worse. Even in these cases, the patient can often accurately remember when it began. The pain may be agonizing in severity and movement may be restricted to a minimum because of resultant reflex muscle spasm. Everyone is familiar with the individual who bends down to pick something off the floor or strains his back in any way and is seized with such pain that he can scarcely get up again. Fortunately these people are the easiest to cure. Sometimes the pain is less severe or may only occur with certain movements which put the affected tissue on the stretch, and the patient can continue with his business without treatment other than home remedies. Tenderness is usually localized to one area by the patient and frequently with careful palpation exact localization can be made. Sometimes it is diffuse, e.g., across the small of the back; such cases are harder to cure rapidly and rarely suitable for injection treatment. Radiation down the course of a nerve in one limb is common and will be discussed under the various regions concerned. Such cases usually respond especially well if pressure over the point of maximum tenderness reproduces the radiation pain.

Accurate diagnosis is essential for successful treatment. The presence of fibrositis and the absence of other conditions may be suspected from the history and confirmed by physical examination. Rapid onset of pain of a type which the patient may describe as rheumatism or neuritis is frequently such that it does not suggest anything more serious to the physician.

It is not always easy to be certain that the lesion is not on a traumatic basis because some form of strain may precipitate an attack of fibrositis, and a similar history with acute pain in, for example, the back, shoulder, or intercostal region may give similar physical signs. Moreover, identical treatment by injection will usually relieve either condition. There may be a similar basis in the causation of the actual pain whatever the actual lesion is. On the whole, in a true sprain there is a history of more definite trauma and the pain tends to recur when the local injection wears off although it helps recovery markedly.

The point of maximal tenderness must be found and is usually confined to an area covered by a finger tip. There may be two and, rarely, more such points and it is best to mark them with a skin pencil or fountain pen. It is also advisable, when they have been found, to keep the patient in the position in which they were found until the injections are given, because if he moves it is sometimes difficult to find them again. Prolonged and patient palpation may be required, especially in the gluteal region, and with the patient in different positions. Localization may be aided by putting the various muscles, ligaments, or fasciae on the stretch as pain will be at once elicited if the lesion is situated in that tissue. Sometimes, moving a limb or part of the body into a different position will uncover the lesion and make it more easy of access to the palpating finger. Very firm pressure may be needed. A wheal is then raised with 1 per cent procaine and the finest hypodermic needle attached to a 2 cc. syringe. A larger and longer needle is then attached (No. 12 is suitable) and gently pushed on through the wheal until the actual lesion is struck. The patient will have no difficulty in recognizing this as it causes a sharp pain which he usually realizes is the "right spot," and if there has been previous radiation, this will be reproduced. The plunger is pressed home at once with immediate relief. The syringe is then detached and an additional

2 cc. are injected. If the exact spot is not picked up the needle should be gently inserted in a slightly different direction. If one feels sure one is near but cannot actually strike the lesion it is worth while inserting about 10 cc. and massaging it around in the hope of causing some relief, but this is rarely complete and the effect is less satisfying. The patient should be told to work off his stiffness during the next few hours, take two aspirin tablets, codeine on going to bed, and return in two days if not cured. There is nothing to be gained by using a stronger solution of procaine. The addition of adrenaline to the solution, which is sometimes advised, is not indicated. There is no reason to localize or delay the action of the procaine and the occasional after-effects are undesirable.

There should be no danger of sepsis and in hundreds of cases it has never once been experienced. There is no need to sterilize the skin. Soap and water cleansing is adequate. Iodine applied immediately before has no sterilizing action but is useful for marking the spot. Provided that contamination is avoided and care is taken not to touch the needle, all that is required is a sterile syringe, solution, and needle. There is no need to wash up or use gloves.

If there is a subsequent return of pain the injection may have to be repeated on a second or even a third occasion. This is most usual in long-standing cases and is presumably due to the lesion not having been completely abolished so that the mechanism for producing the referred pain is still operative. An aching sensation in the affected part may be present for a few hours.

The author discusses a few characteristic regions of the body in detail, and his conclusions are as follows:

The treatment of fibrositis by local injection is simple and efficacious. This method is not advocated as a cure-all for any type of muscular pain. Suitable cases for injection treatment together with detailed technique are described.

A clinically similar condition resulting from trauma may likewise be rapidly relieved.

Accurate localization is essential for successful treatment.

The fibrositic area is one of marked local tenderness, often with referred pain on pressure, and both types of pain together with the physical signs resulting from muscle spasm are removed by the injection. ROBERT T. MCELVENNY, M.D.

Lewin, P.: Kenny Treatment of Infantile Paralysis during the Acute Stage. *Illinois M. J.*, 1942, 81: 281.

The Kenny treatment of infantile paralysis has received sufficient indorsement of the medical profession to justify its general employment in the acute stage.

Miss Kenny predicates her theory on the belief that the basic harmful factors in infantile paralysis are pain, muscle spasm, mental alienation, and muscle inco-ordination. She believes that muscles

Fig. 1. Hot fomentations applied for gastrocnemius spasm. Dotted lines indicate extent of applications, covered by rubber sheeting and binder.

which were formerly supposed to be flaccid, are for the most part, stretched from their normal resting positions by the abnormal condition of spasm in the primarily affected muscles. Her treatment begins immediately upon making the diagnosis. It is aimed at the abolition of pain and muscle spasm.

This is accomplished by hot fomentations and proper rest positions, without benefit of splints. Her system of muscle re-education is based upon the substitution of "mental awareness" for the pathological "mental alienation," and the restoration of co-ordination of muscle activity.

The chief points in treatment are that Miss Kenny employs hot fomentations and muscle re-education, but does not use splints, respirators, braces, or massage.

Kenny has proved that not only is her treatment the opposite of that previously accepted, but the symptoms presenting themselves in patients afflicted with the disease are also the opposite.

The maximum benefit to be derived from the Kenny Method is predicated upon its application immediately after the disease is diagnosed. This means that the treatment should be started during the quarantine period either in the home or in the isolation ward of a hospital.

She never employs massage and she never uses a splint of any kind, or a respirator. She never per-

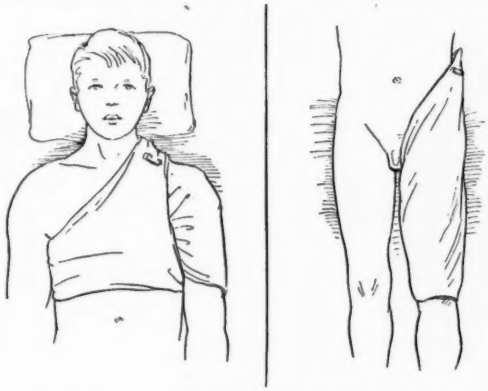

Fig. 2. left, Fomentations applied to chest and left shoulder and arm. right, Fomentations applied to left hip and thigh.

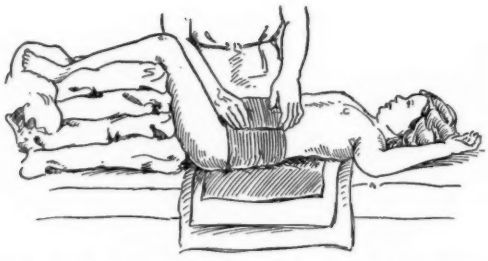

Fig. 3. Hot fomentations for abdominal and low back "muscles in spasm." Note flexion of thighs to relax psoas muscles.

mits active or passive exercises of a muscle that is still in spasm.

Unfortunately these terms denote meanings that are not readily understood by American doctors, physical therapists, or nurses. My interpretation of them is as follows:

Muscle spasm means a physical condition of a skeletal muscle, characterized by tenseness, firmness, tautness, prominence, tenderness, and pain upon being put on the stretch, because of its incomplete relaxation.

Mental alienation which occurs in the flaccid muscles, means the abnormal condition which permits or determines a physiological but not an organic interruption of continuity of impulses between the central nervous system and the skeletal muscles.

Inco-ordination means the unphysiological condition which predisposes, permits, or determines the substitution of muscle action by one muscle for the one which normally performs that certain movement. It is a physiological interruption or paradoxical innervation, producing a "twist" in neuromuscular function.

Kenny claims that the affected muscle in acute poliomyelitis is the "muscle in spasm." She claims that what has been called the flaccid muscle is the "alienated" muscle. She believes that muscle spasm is a constant accompaniment of the muscle pain and that it may be the real and sole cause of pain. An alienated muscle atrophies even though it is the normal muscle and thereby causes flaccidity.

She claims to have proved that the painful muscles are the muscles in spasm and are the ones primarily affected by the disease; they are shortened through spasm and eventually become hard, inelastic masses, paralyzing their opponents from disuse, provided they, too, are not in a state of spasm and shortening.

Unaffected opponent muscles are stretched beyond their normal relaxation. It is impossible for them to contract, as it is impossible for the muscles in spasm to relax and take up the slack. It is impossible for the overstretched muscle to pull from its point of attachment. The "brake" that is caused through the over-contracted opponents will not allow this muscle to contract.

As evidence of the paramount importance ascribed to muscle spasm, I call your attention to the fact that Miss Kenny divides the disease into two stages: (1) acute, while pain and spasm are present; and (2) convalescent, after pain has been relieved and spasm eliminated.

Miss Kenny's theory of the situation in acute anterior poliomyelitis is manifested by the presence of

1. Pain.
2. Muscle spasm.
3. Muscle inco-ordination, due to pain and the substitution of muscle function.
4. Mental alienation in which state the patient loses the faculty of performing normal muscle function.

Her treatment is aimed at:

1. The abolition of muscle spasm.
2. The substitution of mental "awareness" for the pathological "alienation."
3. The restoration of co-ordination of muscle activity.

Her treatment includes:

1. Proper bed placement—natural rest position.
2. A foot board to preserve the "standing reflex."
3. Hot fomentations to relieve pain and muscle spasm.
4. Special analysis, classification, and re-education of muscles.
5. Passive movements.
6. Concentration of active movements on the insertions of muscles and tendons.
7. The abandonment of all splints, respirators, and artificial feeding.

The most common symptoms presenting themselves in the acute stages are muscle spasm and inco-ordination.

Her technique can be outlined as follows:

1. Proper bed placement—natural rest position.
2. A foot board to preserve the "standing" reflex, i.e., to maintain and stimulate the plantar reflex.
3. Hot fomentations to relax muscle spasm—in some cases every half hour; in others every two hours from 8 a.m. to 8 p.m.; in some cases during the night also, according to the severity of the symptoms, especially pain. The packs do not cover the large joints.
4. Special analysis, classification of muscles—determination of spasm, alienation, and inco-ordination.
5. Re-education of muscles, concentrating on insertions of muscles and tendons, active and passive movements as complete as comfort permits. Muscle stimulation: a passive manual extension of muscle is given in connection with the reapplication of packs. This is an important procedure. Passive exercises are given twice daily as pain will permit, after the first few days.
6. The avoidance of fatigue.
7. The abandonment of all splints, respirators, and artificial feeding. Difficulty in breathing

is caused by spasm in muscles used in respiration (except bulbar cases), which may be relieved by packs. The patient must be taught to breathe properly.

HOT WET PACKS

Hot wet packs are applied to all "muscles in spasm."

Woolen strips saturated with boiling water for twenty minutes are taken out of the sterilizer or other container with forceps and run through a wringer twice so they are practically dry.

The fomentations are boiled in a sterilizer and are then lifted out with forceps and placed in a mobile tub, under a piece of waterproof sheeting. The tub is wheeled to the patient's bedside where everything has been placed in readiness. The nurse lifts the fomentation with forceps and runs it quickly twice through the wringer attached to the tub and applies it to the area to be treated (Fig. 1). They are applied very quickly from one joint to another, but not over the joints because that would enclose tendon insertions. These dressings are protected with oiled silk and covered with dry warm wool. They may be changed every half hour during the first twenty-four and forty-eight hours. This routine is continued twenty-four hours a day in some cases.

After the extremely sensitive period has passed, the procedure is carried out every two hours from 8 a.m. to 8 p.m. A two-person team is very efficient. A small roll of towel material is placed under the knees. The "proprioceptive nerve center" area should not be covered during the night, as long as there is spasm in the muscles.

In the very acute cases in which the patients are seriously ill, the foments are changed as fast as they cool. The principle is that the foments are put on very hot, and remain hot for fifteen minutes. They gradually cool down, and that cooling process is good for the muscles and nerves.

During the treatment with fomentations the patients should drink much water.

POSITION OF NATURAL REST IN BED

Upon admission to the hospital, the patient is placed upon a rigid bed to keep the body in correct alignment. Boards are placed under the mattress, a board is placed at the foot of the bed to maintain the sensation of contact, both in the recumbent, and erect positions, and to re-establish the normal standing reflexes which are comparable to the "Stutz" reflex in other animals, that is, the inducement of the normal contraction of all standing muscles when the sole of the foot comes in contact with a hard surface. It is not used while there is painful spasm of the posterior leg muscles.

A small pad is placed under the knees and sometimes a padded roll is used to prevent the legs from rotating outward. Patients are turned to the prone position for an hour twice a day. In the face-lying position the feet are placed over the foot of the mattress so that they are at right angles to the lower part of the leg and the toes are in the clear. The side-lying position is not permitted. The arms remain at the sides of the body. A pillow for the head is permitted and, after co-ordination has been re-established, the patient is allowed freedom of movement in bed.

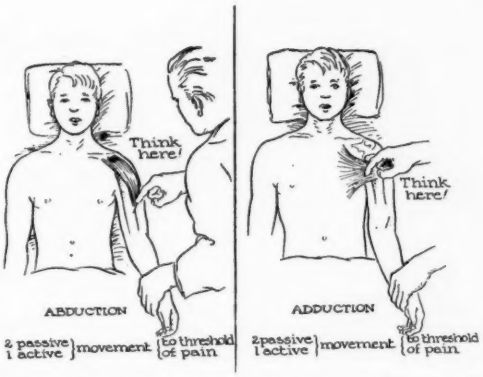
Think here!
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Fig. 4. Muscle re-education. left, For deltoid. right, For pectoralis major.

The bulbar cases are treated by hot fomentations to the back of the neck and to the pectorals, around the neck, and covering the sternocleidomastoids.

Re-education by directed active movements and exercises is her method of teaching the patient mental concentration. The emphasis on maintaining normal muscle rhythm and developing co-ordination from the beginning of treatment, merits much commendation (Fig. 4).

Later treatments include: physiological stimulation of muscles; concentration of attention and effort on the insertion of muscles; and avoidance of substitution of muscle power.

To prevent this substitution of muscle function the patient is directed to focus his mind on the point of insertion of the muscle or tendon to bone.

There is no doubt that the treatment abolishes pain and stiffness and decreases the occurrence of deformities. It prevents contractures, lessens the degree of paralysis, and, by attacking the symptoms which appear in the acute stage, procures a higher percentage of full recovery than any other method.

Among the most important practical benefits derived from this treatment are rapid relief from pain and sensitiveness and prevention of contractures.

Gross deformities either do not occur or are minimal.

Undesirable visceral disturbances are not evident. Contractures are absent.

Taylor, F. W.: Chronic Hemolytic Streptococcus Ulcers of the Extremities. *J. Am. M. Ass.*, 1942, 118: 1196.

Chronic hemolytic streptococcus ulcer of the extremities has received little attention and comment,

especially in view of the fact that the lesion itself forms a clear-cut entity and that there is a specific treatment for the condition.

There are about 5 of these cases reported in the recent literature. Nevertheless 31 such cases were seen in the surgery clinic of the Indianapolis City Hospital during the past two and one-half years.

This ulcer bears no relation in appearance or course to the burrowing ulcers or symbiotic gangrene described by Meleney. The ulcer starts at the site of a slight cutaneous excoriation or insect bite. After a few days a small indolent ulcer appears. Pain is not an outstanding feature.

The ulcer has none of the characteristics which suggest to the clinician the possibility of a hemolytic streptococcus infection. The tissue reaction is slight, being confined to the reddened ulcer margin. There is no surrounding edema or lymphangitis. The base of the ulcer weeps a watery serum from pale atrophic granulation tissue. The lesion gives the impression that the tissues are making little or no effort to heal the defect.

Practically all the ulcers are found on the lower leg. In this series of 31 cases only 2 were present on the hand. The hemolytic streptococcus was found in all ulcers but not always on the first culture. The organism is usually associated with some contaminant, but is not considered to be growing in symbiosis. The most common contaminant was the staphylococcus albus.

There is one feature of the disease which is an aid in diagnosis. Most chronic ulcers have a definite background. They are superimposed on old varicosities, arteriosclerosis, frost bite, or syphilis. This is not the case in chronic hemolytic streptococcus ulcer. This ulcer has no such background. It is seen most frequently in children and young adults. The average age in this series was twenty-two years. The oldest patient was fifty-seven, the youngest three.

Taylor recommends that sulfanilamide be given by mouth. The dosage must be adequate or the treatment will fail. Adequate dosage is between 60 and 70 gr. per day. In the series 19 patients were given adequate dosage of sulfanilamide. The ulcers healed in this group within two weeks after treatment was started. ROBERT T. MCELVENNY, M.D.

Daly, M. M. I., Greenbaum, J., Reilly, E. T., Weiss, A. M., and Stimson, P. M.: Early Treatment of Poliomyelitis. *J. Am. M. Ass.*, 1942, 118: 1433.

The authors discuss the treatment of anterior poliomyelitis as it was carried out in the Willard Parker Hospital, New York, in 1941.

Seventy-one patients were treated. No deaths occurred. Thirty-one patients were treated by "orthodox" methods. In this group, contractures were present in 17 patients observed and were apparently due to immobilization.

Twenty-eight cases were treated by a method which closely simulated the Kenny treatment. Spastic muscles were found in all patients. Complete comfort while at rest was reported after from one to three days of hot packs. Reduction in the nursing personnel and likewise a decrease in the hot packs resulted in an increase of muscle spasm. Atrophy and deformity were rarely seen in patients treated from the onset of the disease.

Forty-three cases which received orthodox treatment are discussed in detail.

Twenty-eight cases were treated by the Kenny method. Comfort, freedom from atrophy and deformity, rapidity of recovery, and extent of recovery were markedly superior when the Kenny method was used. RICHARD J. BENNETT, JR., M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Cohen, H. H.: "Strain" Thrombosis of the Axillary Vein. *J. Bone & Joint Surg.*, 1942, 24: 452.

A "strain" thrombosis should be distinguished from thrombosis or thrombophlebitis caused by direct external injury. The lesion is predominantly a disease of the right arm of young, robust, hard-working males. It comes on rather acutely either immediately or a few hours after some sudden strain of the arm, or after physical effort or exercise which may be unusually severe or of an unusual type. In some cases a history of indirect trauma cannot be elicited.

The history of the case of strain thrombosis of the axillary vein reported herein is described in detail by the author. Although the vein was not actually visualized surgically, the history of an accident with probably indirect trauma to the axillary veins, the enlargement of the arm, the prominence of the superficial veins of the arm and anterior pectoral region, the increased number of superficial veins noted clinically and revealed by infra-red photography, the increased venous pressure, the prolonged circulation time, and the diodrast injection established a diagnosis of thrombosis of the axillary vein.

The etiology of axillary thrombosis following indirect trauma is still obscure, despite the theories advanced to account for it. Most observers agree that thrombosis follows indirect trauma to the vein, such as a shoulder strain. The prognosis is good with regard to life. The duration of the disability is variable; there may be a complete return of function in several months, but in the majority of cases the convalescence is prolonged, lasting many months. Recurrent attacks of edema, weakness, and stiffness may follow prolonged exertion so that these patients do best with change of occupation. Recovery indicates an adequate collateral circulation with possible canalization of the thrombus.

In the majority of cases the patients have been relieved during the acute stage by rest, bandaging, elevation, leeches, physical therapy, and other methods of local care applied in the treatment of phlebitis. Some authors have advised thrombectomy or excision of the entire segment of the spastic veins, when found. In the case here presented, no treatment other than a change of occupation was found necessary.

HERBERT F. THURSTON, M.D.

Vaughn, A. M., and Lees, W. M.: Fatal Pulmonary Embolism Following Varicose-Vein Injection. *J. Am. M. Ass.*, 1942, 118: 1293.

Within the past two decades the obliteration of varicose veins by the injection of sclerosing solutions has become an accepted form of treatment. This may be associated, however, with a certain amount of danger, regardless of the fact that it is being and has been employed daily in the treatment of thousands of patients with no resulting serious complications.

Serious reactions to the injection of sodium morrhuate have been encountered and reported. In the case reported herein the death was proved to be due to pulmonary embolism. The first case of fatal pulmonary embolism following the injection of sclerosing solutions for the treatment of varicose veins was reported in 1922. In this report the authors tabulate the reported cases of fatal and nonfatal pulmonary embolism following the injection treatment of varicose veins. There were 44 cases of the former and 17 of the latter.

The authors conclude that the injection treatment of varicose veins is not free from complications, which may even be fatal. Injection of too large amounts of sclerosing solution, as was the vogue in the earlier days of treatment, is dangerous. It is noted in the tabulation of fatal cases that from 40 to 90 cc. of solution was used in some. No more than 10 cc. of solution should be injected at any one visit.

In the presence of thrombophlebitis, injection is a potential source of embolus. In the injection treatment of varicose veins, proper selection of cases, skilled technique, and the complete co-operation of the patient after the injection in continuing routine daily activities will lessen the frequency of pulmonary embolism. Bedridden patients should not be injected. It is important to keep patients ambulatory following the injection treatment of varicose veins.

HERBERT F. THURSTON, M. D.

Owings, J. C., and Hewitt, J. F.: Successful Experimental Ligation and Division of the Thoracic Aorta. *Ann. Surg.*, 1942, 115: 596.

A new method of successful ligation and division of the thoracic aorta in the experimental animal is presented. The technique is as follows:

Under intratracheal ether anesthesia the left chest is entered laterally through the fourth interspace. The lung is retracted and the descending portion of the arch and the upper portion of the thoracic aorta are freed from the chest wall by blunt dissection. A strip of sheet rubber, 1 mm. thick by 1 cm. wide, is placed around the vessel just above the first intercostal artery. It is tightened in the shape of a funnel (the large end toward the heart) by means of silk mattress sutures. This causes a graduated and incomplete constriction of the vessel, and allows for expansion and contraction. The lung is re-expanded and the wound closed.

Three weeks later the second operation proceeds through the fifth interspace and a second constriction is applied in the same manner between the first and second intercostal arteries. This is tightened to the same degree as the first one. About a month or six weeks later, a third stage may be necessary and should be done in the same manner as the above by

applying the rubber band one intercostal artery lower. Ligation is done below the last constriction four to six weeks later. Silk ligatures are placed 1 cm. apart, and the intervening portion of the vessel is crushed to promote fibrosis. At a later operation, the crushed portion of the vessel may be cut. The divided ends of the aorta will usually retract and often cause enough angulation of the intercostal arteries to impair greatly the collateral circulation. The cut ends of the aorta may be tied together or the intercostal arteries transfixed in position.

Seventy-five dogs and 4 cats were used in this experiment. One hundred and sixty-two operations were done. Only 6 animals lived any appreciable time, and 2 of these were killed because of paralysis in the hind extremities. The causes of death in the others varied, but it is well to note that 28 died from hemorrhage due to the cutting of various types of bands through the wall of the aorta. The remaining 4 dogs would apparently have lived for an indefinite period.

Physiological studies indicated that the collateral circulation which develops is sufficient to allow normal function of the vital abdominal organs. Tests of the liver and kidney function and blood chemistry were made. Blood pressure above the site of ligation apparently remains high, for as long as three years at least, and may lead to destructive lesions of the eyes. Retinal separation and hemorrhage were encountered. The collateral circulation was found to develop through the internal mammary vessels and the phrenic artery into the intercostals below the site of division, back into the aorta, and directly through the superior and inferior epigastric vessels into the iliac arteries. H. C. JERNIGAN, M.D.

Richards, R. L., and Learmonth, J. R.: Lumbar Sympathectomy in Treatment of Popliteal Aneurysm. *Lancet*, Lond., 1942, 242: 383.

The authors report a case of a man, aged thirty-two, who had for two months noted a swelling behind his right knee which gradually increased in size and ultimately became pulsatile. As the swelling increased he began to feel pain behind the right knee and a tired feeling in the leg. At the time of examination the superficial vessels of the right leg were dilated; however, the pulses in the foot were normal. The right leg, which was the site of the aneurysm, was approximately 6 degrees warmer than the left. The Wassermann and Kahn reactions were positive.

As a preliminary to the operation upon the aneurysm, a lumbar sympathectomy was performed. Following the performance of this operation, the femoral artery was compressed three times a day digitally, to increase the amount of collateral circulation. About three weeks after the performance of the sympathectomy, the aneurysm was explored, under a tourniquet. The popliteal vein was found to be thickened and closely adherent to the sac. The aneurysm was of the fusiform type. The entire aneurysm was resected and all of the branches leaving the vessel were ligated.

At no time subsequently did the patient have any pain in the muscles of his calf, nor did frequent measurements of the circumference of the calf reveal any atrophy. The peripheral pulses did not return, and the patient walked well without the slightest trace of a limp for a distance of over a mile. The foot on the involved leg was warmer than normal and remained so. The authors cite the work of Theis, as well as that of Mulvihill and Harvey who showed that the lowered peripheral temperature, after ligation of the artery in a leg of a dog, could be immediately overcome by removal of the lumbar sympathetic ganglia. White and Smithwick also have mentioned cases of popliteal aneurysm in which the circulation was improved by sympathectomy. The authors believe that the sympathectomy is sufficient to maintain a constant surface temperature which is higher than normal, and thus in later life it will help to protect the limb from the dangers of vascular insufficiency.

The interesting part of their report is that the toes on the involved side were definitely and considerably warmer than the toes on the normal side.

WILLIAM C. BECK, M.D.

BLOOD; TRANSFUSION

Wilkinson, J. F., Bullock, K., and Cowen, W.: Continuous Method of Drying Plasma and Serum. Plant for Spray-Drying Plasma or Serum; Routine Employed; Results. *Lancet*, Lond., 1942, 242: 281.

Desiccated plasma and serum are particularly advantageous under war conditions because of their stability, economy of storage, ease of transport, and availability for use in concentrated solutions. The authors have devised a desiccating apparatus which is of value for the following reasons: sterility is easily controlled; heat-labile substances in the plasmas are not destroyed; the plasma proteins are not denatured; and the process is economical, can be run continuously, and can desiccate from 1½ to 2 liters of plasma per hour.

In principle, the apparatus does not differ greatly from commercial driers of milk and other such substances. The apparatus essentially consists of a large drying chamber into which the plasma or serum is blown in a very fine umbrella spray from an atomizing jet in the top of the chamber, into a current of warm sterile air circulating within the chamber. The dried plasma or serum collects at the bottom of the chamber, and also in a second smaller chamber or "cyclone" adjacent to the air exit. The dried plasma is then collected under sterile conditions in storage bottles by an ingenious device which permits continuous operation of the desiccator. Mechanical details of the entire apparatus are described and illustrated adequately, and detailed instructions regarding the operation and sterilization of the outfit are given.

Numerous biological, physical, and chemical tests were run on the products of desiccation to determine

what changes, if any, occurred during desiccation. The products of desiccation of human plasma, plasma-saline solution, and serum are sterile, fine, dry powders containing from 3 to 10 per cent moisture, and are readily soluble in water, yielding clear solutions.

These products can be completely desiccated to "chemically dried" powders having a moisture content of less than .01 per cent by exposure *in vacuo* over phosphorus pentoxide.

Human and guinea-pig sera when spray-dried retain their complement titers unchanged; human sera show no lowering of anti-A and anti-B agglutinin titers. The dried sera can be reconstituted into clear solutions, indistinguishable from the original plasma, plasma-saline solution, or serum. The dried plasma or serum will dissolve readily to as much as a five-times concentrated solution of the original plasma, which is useful clinically.

Clinical results obtained from the use of these reconstituted liquids appear to be identical to those obtained from the original undried plasma, plasma-saline solution, or serum. LUTHER H. WOLFF, M.D.

Heath, F. K., and Province, W. D.: Human Plasma; Report of Studies with the Sulfonamide Compounds. *J. Am. M. Ass.*, 1942, 118: 1034.

Between August, 1940, and January, 1941, in New York, the Blood Transfusion Association, in co-operation with the American Red Cross, prepared 6,151 liters of liquid human plasma for England. Of this amount 8.5 per cent was found to be contaminated despite the use of 1:10,000 merthiolate.

Because of this finding and the observations of Novak and other workers in this field, the authors investigated further the use of the sulfonamides in the preservation of blood plasma. Their experiments indicate that these drugs unquestionably exert a bacteriostatic effect on some organisms. This is best shown in the tubes exposed to contamination by air, in which at a concentration of sodium sulfathiazole of 200 mgm. per 100 cc. very little growth occurred. On the other hand, when similar tubes were specifically contaminated with known organisms growth was persistent.

Because of the latter observation and the impossibility of controlling either the type or extent of contamination, the authors believe that these agents are not sufficiently inhibitory under all conditions to make them safe preservatives for stored plasma.

J. M. MORA, M. D.

Kolmer, J. A.: A Note on the Survival of Treponema Pallidum in Preserved Citrated Human Blood and Plasma. *Am. J. Syph., Gonor. & Ven. Dis.*, 1942, 26: 156.

Fresh, citrated human blood, heavily seeded with virulent treponema pallidum, undergoes spontaneous sterilization in about seventy-two hours when kept at from 4 to 6°C.

In the case of citrated plasma, spontaneous sterilization may occur in about twenty-four hours, probably because centrifuging seeded citrated blood removes some of the treponemas, and because of further possible devitalization of the organisms which follows centrifuging and associated manipulations.

The addition of arsphenamine or neoarsphenamine to citrated blood in a final concentration of 1:10,000, is completely destructive for treponema pallidum after an exposure of fifteen minutes at room temperature. This method is advised in the case of doubt regarding the possibility of syphilis in donors, and especially in the case of "donors of necessity," involving the use of the blood of known syphilitic individuals. SAMUEL KAHN, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Thorner, M., Gibbs, F. A., and Gibbs, E. L.: The Relation Between the Electroencephalogram and Flying Ability. *War Med.*, 1942, 2: 255.

In these days it is of the utmost importance to utilize properly the personnel at our disposal, and the selection of various men for their flying ability is an important branch of this subject. The electroencephalogram is an indicator of cerebral function and good cortical function is essential to competence in aviation. It is true also that petit mal attacks may be manifest by only the slightest abnormalities in behavior. For instance, an individual may go on writing during an attack, perhaps write a "9" instead of an "o". Such an apparently minor aberration during a critical moment in a fighter plane or a bomber may lead to disaster either to the pilot himself or to the whole crew. In a case of this kind an electroencephalogram would show the true nature of the trouble.

The investigation was carried out on 109 aviators, 55 of which were student fliers and 54 were pilots. Six leads were used over frontal, parietal, and occipital areas. Overventilation was carried out for three minutes at the end of every test. The examination of the cortical waves was carried out without knowledge of the subjects' flying rating. Three men had definite bursts of epileptoid activity in their control records.

A definite correlation was established between flying ability and (1) the distribution of energy in the right occipital spectrum, (2) the dominant frequency and character of the control encephalogram (ink record), and (3) the amount of slowing that occurs with overventilation.

Although the number of cases is small, it seems that with suitable data it may be possible to select a superior group of candidates for flying instruction. The investigation is in progress at several major flying fields, this study having been made at Randolph Field, but there is no immediate prospect that it will be used by the Army in examining candidates for flying training.

ADRIEN VERBRUGGHEN, M.D.

Kennedy, A. M., and Ingham, J.: Porphyrinuria in T.N.T. Poisoning. *Brit. M. J.*, 1942, p. 490.

The authors have found a simple clinical test, with 20 per cent sulfuric acid, of value for the rapid detection of excessive amounts of porphyrin pigments in the urine of T.N.T. workers. The incidence of porphyrinuria found in a series of 431 workers in contact with T.N.T. suggested that it was probably present during the development of symptoms, and possibly for some time while the worker's health was subnormal and before disablement compelled him to cease work. The removal of positive workers from contact should improve health and efficiency. It is suggested that, pending a further survey, strongly positive and positive workers be removed, and weakly positive workers be watched and retested.

The rapid test described for crude porphyrinuria in T.N.T. workers yielded information unobtainable from the Webster test, and might usefully replace it.

WALTER H. NADLER, M.D.

Radley Smith, E. J.: Tetanus in a London Sector in Two Years of War. *Proc. R. Soc. M.*, Lond., 1942, 35: 340.

An effort was made to collect cases of tetanus occurring in Sector 9 by making them notifiable to the group officer, and in the first two years of war, 7 or possibly 8 such cases were noted. Only in 3 cases, in which the injuries were severe, deep and with muscle involvement, did conditions arise which are usually considered favorable for the development of tetanus. In the fourth case there were no wounds other than superficial burns, and in the fifth case there were only a few clean cuts caused by window glass, which had all healed in less than nine days. All of the cases but 1 occurred in civilian casualties and the only soldier who contracted tetanus had escaped the customary active immunization. This is especially significant inasmuch as, for a period of one of the two years, there were 4,562 civilian air-raid casualties and about 6,500 Service casualties treated. Both Service and civilian casualties received prophylactic antitetanus serum but, in addition, the troops had been actively immunized with toxoid as well. Among those so immunized, no case of tetanus has been noted, although the most favorable circumstances for its development were found in the severely wounded from Dunkirk and Belgium, some of whom had been virtually untreated for days, and among whom a considerable number did develop gas gangrene. In all but 1 case prophylactic serum, usually a dose of 3,000 units, had been given soon after the wound had been inflicted. It is clear that such a single dose does not prevent tetanus. Furthermore, it does not guarantee that the tetanus which arises will be local, delayed, or mild, since 4 of these cases were of the generalized and severe form.

The author concludes (1) that the small number of cases of tetanus recorded might be reduced even further if after the first dose of 3,000 units 2 additional doses be given at weekly intervals, and (2) that active immunization with tetanus toxoid, as practiced by the Royal Army Medical Corps, is of great value.

EDWIN J. PULASKI, M.D.

Papper, E. M., and Rovenstine, E. A.: Utility of Marrow Cavity of Sternum for Parenteral Fluid Therapy. *War Med.*, 1942, 2: 277.

In 1940 Tocantins described the introduction of fluids into the general circulation via the bone mar-

row. This avenue for administration of fluids has advantages when clysis is inadequate, when veins are inaccessible because of generalized edema or widespread burns, or when circulatory collapse necessitates time-consuming dissection to permit placing a needle intravenously. A needle in the sternum becomes fixed firmly in place without additional support. This gives this method a particular application for restless or excited patients who may often dislodge intravenous needles during their periods of hyperactivity; or for those requiring transportation. In patients requiring long-continued fluid therapy, thromboses of veins, with the possibility of infection or embolism, may develop in a relatively short interval of intravenous administration. Bone-marrow infusion minimizes or eliminates these hazards and, in addition, is the only route for effective fluid therapy after all of the available veins have been thrombosed.

The technique is relatively simple, and elaborate or expensive equipment is not needed. The lower part of the manubrium or the upper part of the body of the sternum is selected because the spongy bone layer is thickest in this area. An intradermal wheal is raised with a 1 per cent solution of procaine hydrochloride, and through it a needle is advanced to the periosteum, which is infiltrated with 2 or 3 cc. of the same solution. The sternal puncture needle is then inserted directly in the midline through the anesthetized region until firm contact is made with the cortex of the bone. Steady pressure is made on the hub of the needle against the sternum, the point of the needle being directed cephalad at an angle of about 30 degrees with the anterior wall of the chest. When the compact bony table is pierced a sudden diminution of resistance is felt. A needle correctly placed is from 2 to 2.5 cm. beneath the skin surface. When the needle is in place, the stylet is removed and air and marrow contents are aspirated.

If the needle is correctly placed, marrow elements and blood will be drawn into the syringe. This procedure is slightly painful. After aspiration, solution of sodium chloride is injected to clear the needle and the fluid container is attached to the needle by sterile rubber tubing. Fluid is allowed to run in by gravity flow. The rate of flow is adjusted to suit the needs of the patient. After from six to twelve hours, the needle may become partially or completely blocked, and surely will if a decrease of pressure in the tubing allows bone marrow to enter the needle, where it quickly coagulates. If this occurs the needle need not be removed but can be cleaned by inserting and removing the stylet and then injecting fluid under slight pressure.

If the needle is incorrectly placed, the error is easily detected. It is improperly placed if it is not firmly fixed. If it is introduced subcutaneously, the tissues will swell visibly at once. If in a great vessel or the heart, blood will well out immediately before aspiration can be done. A drop of fluid on the syringe end of the needle should remain there if the sternal needle is in the correct position. If it has entered the pleural space, the drop will be aspirated or the fluid will be seen to move synchronously with respiration. These are the immediate possible but unlikely errors.

The complications are infection of the tissues overlying the sternum, or osteomyelitis of the sternal bone. These are best avoided by strict compliance with asepsis during the insertion of the needle and during subsequent handling of the needle *in situ*. The danger of fat embolism is not considered important. Whole blood, plasma, and a 5 per cent solution of dextrose in saline infusion have been given, with completely satisfactory results. The patients do not experience discomfort during the procedure, except for the periods when a blocked needle required cleaning.

In the authors' cases the needle remained *in situ* for periods ranging from two and a half hours to six days, and fluids were given in amounts ranging from 675 cc. to 15 liters. The speed of administration varied from 2.5 to 10.3 cc. per minute. In addition to the conventional parenteral fluids just listed, pentothal sodium in a 5 per cent solution, as used for intravenous anesthesia, was instilled into the sternal bone marrow. Anesthesia is produced as rapidly and as easily as by intravenous injection.

MANUEL E. LICHTENSTEIN, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Kamman, G. R., and Medelman, J. P.: The Removal of Iodized Oil (Lipiodol) from the Spinal Canal After Roentgen Diagnosis. *Minnesota Med.*, 1942, 25: 273.

Iodized poppy-seed oil, probably the most valuable of contrast media for roentgen diagnosis of intraspinal lesions, has the objectionable quality of being nonabsorbable and, therefore, potentially irritating to the central nervous system. This objection has been bound up in the fact that its removal heretofore has been considered impossible even during surgery.

The method described by Kamman and Medelman for removal of the oil is as follows:

The patient is placed prone on the fluoroscopic table, the spinous process of the third lumbar vertebra is located by preliminary fluoroscopy, and the interspace just below is marked on the skin. Lumbar puncture is done at this level, exactly in the midline, with a 16 or 18 gauge needle with a short bevel. This level is important because in the average patient the maximum curve of the lumbar lordosis will cause the lipiodol to collect in the area when the patient is placed approximately horizontal. When free flow of spinal fluid is obtained, the lipiodol is injected and the needle is left in position. The authors use 4.5 c.c.

After the necessary study of the dural sac the lipiodol is removed. This is apt to be a tedious procedure. A 2 cc. syringe is attached to the spinal needle and under fluoroscopic guidance removal of the fluid is accomplished by using a slow and as gentle a pull on the barrel of the syringe as possible in inducing the

oil to flow through the needle. By tilting the patient, by slight change of the tip of the needle, but most of all by patient effort, practically all of the lipiodol can be removed. A case illustrative of the method is presented. E. J. PULASKI, M.D.

Burgess, E., and Anderson, R.: Nonoperative Removal of Intraspinal Lipiodol and Thorotrast. *Northwest M.*, 1942, 41: 158.

The removal of lipiodol and thorotrast immediately after their use in myelography is desirable, and when this is possible these substances may be used in many borderline cases to identify lesions of the spinal canal and its contents. Removal of lipiodol within two hours is the optimum time.

The technique used by the authors was modified from the method described by Kubik and Hampton. Diveley's technique of trans-spinal irrigation with Ringer's solution was used for the removal of thorotrast. WALTER H. NADLER, M.D.

Brown, J. B., and McDowell, F.: Massive Repairs of Burns with Thick Split-Skin Grafts. *Ann. Surg.*, 1942, 115: 658.

Realizing that numbers of burns may occur in combatants and civilians, the authors summarize the procedures that have been found of value in repairing burns.

When the full thickness of the skin is destroyed by a burn over a large area, healing will occur by contracture of adjacent tissue and with "scar" epithelium, or permanent healing may never occur.

Consequently, when it is claimed that a certain preparation will insure complete healing without scarring, it is not realized how healing occurs.

If healing is rapid without much scarring or deformity, it simply means that the full thickness of the skin has not been lost, and that regeneration has occurred from the glands of the derma. Hence cleanliness, protection, and the avoidance of strong chemicals are essential to prevent damage to these struggling regenerating cells.

Open surgical drainage is the essence of local treatment of burns, with soap and water and saline dressings or saline baths, together with local chemotherapy with sulfonamides. The object of these procedures is to get the burned area cleaned quickly, so that skin grafts can be applied as soon as possible. When the wounds are clean, the wet packs may be discontinued.

Dressings of fine-meshed gauze impregnated with sulfanilamide ointment or an antiseptic ointment may be used. It is extremely important to use the fine-meshed gauze (No. 44) on all open wounds, since this prevents sticking of the granulations. Plain vaseline is not used since it causes maceration, but sulfanilamide, xeroform, scarlet-red, and boric ointments will prevent skin maceration.

Firm pressure or elastic bandages may be of great advantage in flattening out flabby, edematous granulations into a firm, bright red surface. Cotton mechanic's waste may be used as a pressure medium.

Saline baths have often been a life-saving measure. Pain is greatly reduced, and soap cleansing and gentle débridement may be done while the wound is in the bath with much less pain to the patient. Cleanliness but not sterility is sought. Wet dressings or greased dressings of fine-mesh gauze are used after the bath.

Many deep burns are ready for grafting in three weeks' time, after the procedures outlined. The bacillus pyocyaneus seems harmless to the patient and the wound, but it is exceedingly bad for skin grafts. It must be controlled by thorough cleansing, and with gentian violet or one of the mercurial antiseptics.

Infected tannic-acid membranes occur in all deep burns in which this method has been used. Here again the treatment is open surgical drainage (opening of the membranes and removal of loose areas) plus chemotherapy. Burns of the hands, face, and genitalia aways do best when treated with open surgical drainage from the start.

Thick split-skin grafts of from one-half to three-fourths of the thickness of the whole skin are most useful in repairing the raw surfaces. These grafts include a pad of derma, which is the most important part of a skin graft, and in this respect differ from the Ollier-Thiersch grafts. As much as 220 sq. in. of such skin grafts have been transferred at one time, and 600 sq. in. have been grafted in a single patient by means of the utilization of successive "crops" of grafts. Regeneration from the donor sites takes place from the deep glands left behind in the derma. Donor sites are covered with scarlet-red ointment gauze and not disturbed for ten or twelve days.

The grafts are taken with a very sharp long knife of the amputation variety. The free-hand method of cutting the grafts is the fastest method, and with practice the thickness is easily graduated. The grafts are sutured down all around with No. 000 silk sutures and with multiple mattressing sutures over the surface. In certain areas the grafts may be "snubbed" in place with roller bandage. If granulations are healthy, the graft may be placed directly on them. Usually, however, it is better to shave the granulations down to a smooth yellow base. The granulations are never scraped away, but are cut away. The application of a pressure dressing is fundamental for skin grafts. A single layer of sulfanilamide-ointment gauze or other suitable grease gauze is placed over the graft. Cotton waste is next applied and is firmly bound down with heavy gauze rolls. The dressing is allowed to stay on for from four to six days, after which the sutures are removed, the area is closed, and dressing (either wet or sulfanilamide ointment) is reapplied.

Large sheets of split-homografts may be applied to patients who are "slipping" daily from debilitation and pain. The homografts take well and survive from three to ten weeks. "Takes" of homografts have no relation to blood groups. The grafts absorb in a clean fashion and leave a clean granulating base.

The repair of massive burns can be undertaken successfully with thick split-grafts, the laborious use of full-thickness and pedicle flaps being avoided in many instances. LUTHER H. WOLFF, M.D.

Blalock, A.: A Comparison of the Effects of the Local Application of Heat and of Cold in the Prevention and Treatment of Experimental Traumatic Shock. *Surgery*, 1942, 11: 356.

In a previous communication the author had reported the effects of generalized heat and cold on animals following traumatic shock. He concluded that it was more dangerous to elevate the body temperature significantly in animals with secondary shock than it was to depress it to the same degree. Although the general application of cold does not increase the survival rate of an animal in shock, it lengthens survival of an animal with low blood pressure.

In this experiment large animals were used. Pain was prevented by use of various anesthetic agents as nembutal, barbital, and morphine ether. Shock was produced in the anesthetized animal by repeatedly striking the hind extremity with a blunt instrument. After the shock picture appeared, the injured extremity was immediately enclosed in ice packs in one group of animals. Hot water bottles were placed around the traumatized extremity in the second group.

In all, 25 experiments were performed in which heat was applied and 29 experiments in which local cold was used. The average survival period for the heat experiments was five hours and forty-nine minutes. The average alterations of body temperatures as taken per peritoneal cavity were from plus 6.6° F. (heat) to minus 6.1° F. (cold). The difference in local temperature of the traumatized extremity was from plus 7.7° F. (heat) to minus 47.4° F. (cold).

Although the survival period of animals treated by the local application of cold was twice as long as that of animals treated with local heat, the author emphasizes the fact that these experiments offered no evidence that shock should be treated by causing a depression of the body temperature. Even local heat which is of sufficient degree to cause an elevation of body temperature will cause a generalized increase in capillary permeability by vasodilatation and thus further the shock picture.

Even though these experimental conditions vary from true shock in man, heat should not be applied in extreme degree even locally in shock, particularly if there is no way of immediately replacing the blood volume. HOWARD A. LINDBERG, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Godding, E. W., and Notton, H. E. F.: The Treatment of Phosphorus Burns. *Brit. M. J.*, 1942, 1: 429.

The official method for the treatment of phosphorus burns was re-examined and a more practical and efficient method was proposed after an extensive study involving *in vivo* and *in vitro* experiments.

The skin surfaces contaminated by phosphorus or phosphoric acid are covered by an alkaline powder consisting of heavy magnesium oxide (10 per cent), borax (5 per cent), and sodium bicarbonate (85 per cent). The powdered area is moistened and a paste is formed by massage. More powder and water are applied until effervescence ceases. The paste is then washed off and any remaining phosphorus is inactivated by the use of a solution of copper sulfate (22.5 per cent), glycerin (67.5 per cent), starch (5 per cent), and water (5 per cent). The latter formula may be modified by the addition of sodium tauroglycocholate, which permits reduction in the amount of glycerin in the formula, which spares a valuable war substance. This solution is thoroughly rubbed into the skin until the odor of phosphorus is removed and then it is washed off. All necessary bandages are impregnated with the alkaline powder, applied, and kept moist continuously with water. The patient is labelled as a "Phosphorus Burn," but should not be treated by any coagulation agent such as picric acid, tannic acid, or silver nitrate. Delayed healing in phosphorus burns is due to deep penetration by the phosphoric acid and is best treated by further use of the alkaline powder, or with sodium-hypochlorite solution. BENJAMIN G. P. SHAFIROFF, M.D.

Heggie, R. M., Gerrard, E. A., Heggie, J. F., Bradbury, C. G., and Others: Superficial Granulating Areas Treated with Antiseptic Emulsions. *Lancet*, 1942, 242: 347.

There is a place for simple methods in the treatment of infected superficial burns. The authors have employed lymphagogues followed by antiseptic emollient dressings with considerable success. Lymphagogues proved most effective in the removal of gross infection and in the separation of sloughs. The depot of antiseptic in the emulsions was then usually capable of completing and maintaining the sterility of the area, while the emollient character of the dressing preserved the recently healed tissue when changes were necessary.

Simple and economical buffered isotonic proflavine emulsions of water-in-oil and oil-in-water types are described, as well as similar emulsions incorporating the sulfonamides. By diffusion experiments *in vitro* of these emulsions against serum and plasma, the concentration of available antiseptic dyestuff was estimated to be 2 per cent clinically, the concentration at which proflavine is most effective.

After treatment with saturated aqueous sodium sulfate as a lymphagogue, these proflavine emulsions proved useful occlusive emollient dressings for superficial infected granulating areas, in particular for infected burns of the second degree. Five cases are described. BRADFORD CANNON, M.D.

Lesses, M. F., and Starr, A.: Toxic Effects from the Intraperitoneal Use of Sulfanilamide. *N. England J. M.*, 1942, 226: 558.

The authors report 2 cases in which toxic reactions followed the intraperitoneal use of massive doses of

sulfanilamide: anemia and leucopenia in one case, and hepatitis in the other. They believe the history indicates reaction to the drug rather than to severe infection. They call attention to the findings of Jackson and Coller, who reported icterus in 6 of 25 patients receiving intraperitoneal sulfanilamide.

Extremely rapid absorption of sulfanilamide from the peritoneum occurs even from the inflamed peritoneum, as shown by the rapid elevation of the blood level of sulfanilamide. Although the blood level is not an index of continued peritoneal activity, the authors point out that the local action of such a soluble substance as sulfanilamide is necessarily short. Jackson found a 30 to 40 per cent higher level of sulfanilamide in the portal blood of dogs that had received sulfanilamide intraperitoneally as compared with the level in the jugular blood, and suggested that jaundice might be due to liver damage caused by these higher portal levels. Bieter and his coworkers have shown that there is a selective concentration of sulfanilamide in the liver even when orally administered as contrasted with sulfapyridine or sulfathiazole. In investigating blood levels after local applications of sulfonamide drugs, Goodwin and Findlay point out that it is possible to obtain effective concentrations with locally applied sulfanilamide but not with sulfapyridine or sulfathiazole. Throckmorton's experiments on rats indicated that sulfapyridine, in contrast to sulfathiazole, may be injurious to the peritoneum.

The authors believe, therefore, that available evidence indicates that sulfathiazole rather than sulfanilamide should be used if prolonged intraperitoneal action is desired with a minimum of general effects. MARIAN BARNES, M.D.

ANESTHESIA

Tuohy, E. B.: An Evaluation of General Anesthetic Agents and Methods for Oral Surgery. *Anes. & Anal.*, 1942, 21: 75.

Certain circumstances preclude the use of local or regional methods of anesthesia for oral surgery.

The ultimate choice of the general anesthetic agent and the method to be used should be determined by the type of operation and the general physical condition and age of the patient, and those agents and methods which will be safest for the patient should be used. The patient should be questioned and examined for the purpose of detecting the presence of diabetes, cardiac disease, such as angina pectoris, and pulmonary diseases, such as asthma or tuberculosis, or infection of the upper part of the respiratory tract. When cardiac or pulmonary disease is present and general anesthesia is to be used, only those agents which will permit the adequate administration of oxygen should be employed, since the lack of oxygen, even though slight, may put an additional burden on the patient's cardiopulmonary reserve.

Nitrous oxide and oxygen are probably the most commonly used agents for most intraoral operations. However, ethylene and cyclopropane are valuable when more potent gaseous agents are required. Ether can be added to various gaseous anesthetic mixtures in order to enhance the potency and duration of certain inhalation agents. Premedication is valuable in regional anesthesia, inhalation anesthesia, and in intravenous anesthesia.

Anoxemia should be avoided under all circumstances, but especially when cardiopulmonary disease is present. The importance of a free, unobstructed airway as a primary requisite for satisfactory general anesthesia is pointed out, and various methods of utilizing intratracheal anesthesia are discussed.

Intravenous anesthesia is increasing in favor, especially for dental operations, and is also applicable to certain other types of oral operations on adults, if in each instance an adequate airway is provided and can be maintained for the patient. At present the routine use of intravenous anesthesia in exodontia or other oral surgical procedures is not advocated, but rather it should be considered an adjunct to other methods of anesthesia in special cases.

Pentothal sodium in a 2.5 per cent solution has been most satisfactory in the author's experience. It is administered intravenously, intermittently, and in divided doses.

In the presence of acute suppurative processes in the oral cavity, topical anesthesia is preferred.

Rectal anesthesia is applicable for hospitalized patients under certain circumstances, especially when inhalation or intravenous anesthesia is contraindicated. Avertin is the usual agent employed, the dose of which depends on the age and weight of the patient.

Durshordwe, C. J.: Anesthesia in Neurosurgery. *Anes. & Anal.*, 1942, 21: 61.

Anesthesia has always been a problem in neurosurgical operations because of the close proximity of the anesthetist to the operative field and because of the use of the electrosurgical unit. At the Buffalo General Hospital a plan of procedure has been worked out and is described in this article. Although the methods are not new nor unique, yet they are set out in detail and should be of interest to other surgeons.

Almost all of the patients received avertin as a basal anesthetic, the dose being from 70 to 110 mgm. per kilogram of body weight. This was supplemented in practically all cases with local anesthesia. When necessary, sodium pentothal in a 5 or 2½ per cent solution was given intravenously. The combination of a good airway, a basal anesthetic, and a local anesthetic with the addition of a little intravenous anesthesia was found to be highly satisfactory. As a rule, very little sodium pentothal was required, but it was always very easy to administer because every operation was started with an accessible running venoclysis. This venoclysis was given through a two-way valve and thus the valve could easily be switched over from the clysis set to the syringe containing the sodium pentothal.

The question of shock is brought up in this article, for at the hospital many cranial operations are done in the sitting position. In these shock is more likely to occur. It is pointed out that with the clysis running it is relatively easy to prevent shock by having blood ready to give. ADRIEN VERBRUGGHEN, M.D.

Pender, J. W., and Lundy, J. S.: Anesthesia in War Surgery. *War Med.*, 1942, 2:193.

In succession, various anesthetic agents have increased and waned in favor with the army surgeons, but, as in civil practice, the ideal anesthetic agent has not yet been found. The requirements of such an agent for use in war surgery are even more strict than they are for civilian use, because of the adverse circumstances under which many operations are performed during a conflict. According to Dickson, the ideal anesthetic agent must be safe, portable, capable of being administered by the surgeon, rapid in action, usable with simple apparatus, controllable, capable of being used without a supplementary anesthetic agent, without extrinsic risk, without contraindications, without serious after-effects, nonvolatile, certain of action, and stable on storage. Simplicity must be the keynote of anesthetic technique and equipment, and certainly at all stations as near the front as the evacuation hospitals all equipment for inducing anesthesia must be compact and easily transported, and a supply of new equipment must be continuously available. In the rear the methods and procedures may simulate more closely those used in civilian hospitals.

After a review of the literature, the following predictions were made concerning the use of various anesthetic agents and methods in the present war.

1. Chloroform will be the reserve anesthetic agent for use under adverse circumstances.
2. Ether will form the foundation anesthetic agent when other agents are not satisfactory.
3. Local anesthesia will be either used alone or supplemented whenever possible.
4. Nitrous oxide and oxygen will be most useful for simple induction and for short operations.
5. Spinal anesthesia administered by experienced hands will be safer than ever before for operations performed below the diaphragm.
6. Quick-acting barbiturates administered intravenously will be used more often than any other type of anesthetic agent.
7. Rectal anesthesia will seldom be used.
8. Cyclopropane will be unequaled for anesthetizing many patients in base hospitals.
9. The intratracheal method will be almost the routine manner of administration of the volatile anesthetic agents.

Beecher, H. K., and Adams, R.: Ether Anesthesia in the Presence of Pulmonary Tuberculosis. *J. Am. M. Ass.*, 1942, 118: 1204.

The authors believe that the existing prejudice against the use of ether anesthesia in patients with tuberculosis is unwarranted. The basis for this prejudice can be found in numerous published statements. However, these statements are not founded upon careful study and record keeping. Corper, Brown, Petroff, and Rogers have all reported that repeated ether anesthesia in animals with tuberculosis does not result in a more rapid spread of the disease process. Most of the published material which serves as the basis for the current prejudice against ether was written many years ago and was based upon the "open cone" method of administration. The authors believe that the closed method should be used. For a period of more than five years they have been using the closed method in operations on consecutive patients who have undergone surgical treatment of their pulmonary tuberculosis. Their data include all cases, both favorable and unfavorable.

They have reported on the cases of 147 patients in which 260 anesthesias were given for operation of the following conditions: cavernous disease (87 per cent), pulmonary tuberculosis or tuberculous empyema (5 per cent), unstable fibrotic disease without demonstrable cavitation (3 per cent), and early bronchial disease (1 per cent). Their results are compared with those of other clinics where ether is used rarely, or not at all, and the cases are compared as to early death rate, total death rate, and arrest and apparent cure of the condition.

The anesthetic agent is not important in these cases; however, it should be one that permits the use of a plentiful supply of oxygen and allows the surgeon to carry out a deliberate, unhurried operation. It is important to choose an anesthetic which depresses vagal activity. Ether excels other agents in this regard. The excellent tolerance of the very sick patient for ether anesthesia, as well as the low death rate attributable to ether anesthesia, are well established. After a study of five years, the authors can see no reason for abandoning the use of ether in operations on the tuberculosis patient.

HAWTHORNE C. WALLACE, M.D.

Sahler, S. L., Kellogg, J. F., and Phillips, R. B.: Cyclopropane Anesthesia. *J. Am. M. Ass.*, 1942, 118: 1042.

The authors present a review of 7,120 cases in which cyclopropane was used at the Rochester General Hospital from 1935 to 1940. They emphasize the following points to be considered in giving good cyclopropane anesthesia:

1. An open airway should be maintained. Use a pharyngeal tube in all cases, and an endotracheal tube when the occasion warrants it.
2. Always be on the alert for apnea, and when it arises, maintain passive respiration until active respiration appears.
3. In induction, adjust the mask tightly before opening the cyclopropane valve. Fill the bag half full of oxygen, and after the patient has had a few breaths introduce cyclopropane at the rate of 600 or 700 cc. a minute. After anesthesia has been established, cut down the cyclopropane flow to from 40 to

150 cc. a minute but keep the oxygen flow at from 250 to 500 cc. a minute. Introduce larger amounts of cyclopropane, according to relaxation and breathing. A good level of anesthesia will be reached when the muscles of the face and neck are relaxed, when breathing is slow and rather shallow, and when the abdominal muscles are soft, as reported to the anesthetist by the surgeon.

4. Do not administer sympatheticotonic drugs preoperatively.

5. Give adequate preoperative medication.

6. Do not use any more cyclopropane than is necessary; the larger the amount used, the greater will be the degree of "cyclo shock."

7. Be on the watch for "cyclo shock" during the first half hour to four hours postoperatively and administer adequate amounts of acacia, dextrose, and saline solution to all patients who have had cyclopropane in major surgery which has lasted longer than the average time for the given procedure.

8. When the operation has been of considerable duration, always use carbon-dioxide inhalation intermittently for from twenty-four to forty-eight hours.

9. Use the carbon-dioxide absorption technique in giving cyclopropane routinely but not exclusively. Carbon dioxide is useful during cyclopropane anesthesia at times.

10. Helium is useful as a carrier of cyclopropane and oxygen through a partially obstructed airway. It is also of value in decreasing the explosibility of the cyclopropane-oxygen mixture.

11. Have suction available, conducted through the wall of the operating room and not obtained by means of a suction machine close at hand.

12. A pulse rate below 50 indicates that the patient has had sufficient cyclopropane; it does not mean that the patient is in a dangerous condition, but oxygen should be given at once in full concentration.

13. Ascertain in every case before operation whether the cautery, x-ray, or endoscopic apparatus is to be used; if so, use another gas if inhalation anesthesia is required.

14. There has been no mortality in the 7,120 cases, but there has been an influence by cyclopropane on the morbidity.

15. There is no hard and fast rule in the conduct of cyclopropane anesthesia. Each case must be handled individually and as an entity in itself. With reasonable experience the technique of cyclopropane anesthesia is not difficult, but it does require assiduous attention to the various points enumerated.

J. M. MORA, M.D.

Dodd, H.: Use of Pholedrine at Major Operations. *Lancet*, Lond., 1942, 242: 498.

Pholedrine (veritol) is a comparatively new pressor agent which was introduced with good clinical reports from Germany in 1937. The author has studied its effects during and after major operations under all types of anesthesia and reports on the restorative action of the drug on the blood pressure. With increasing experience he used blood-pressure stimulants less and less during operations. Of several pressor agents employed, pholedrine has been the main one since 1938, and it has supplanted ephedrine to counteract falls in the blood pressure during operations under spinal anesthesia.

An analysis is made of the blood-pressure charts of 89 patients who received pholedrine during major operations. The effective dose was found to be from 0.2 to 0.25 cc. intravenously or 1 cc. intramuscularly; or the same intravenous dose plus from 0.75 to 0.8 cc. intramuscularly. In 59 of 60 patients who required only a single dose of pholedrine the normal systolic pressure was restored or exceeded after a single injection. Repeated doses were given to 27 patients, and 74 per cent of these injections restored the pressure to within 25 per cent of the preoperative level.

Excessive rises in blood pressure after pholedrine are avoided by correct evaluation of the patient's condition and accurate estimation of the dose. With 126 injections of pholedrine no fall in pressure was observed, and there were only 3 instances in which a variability in the pulse occurred. Cardiozol used alone was found to be ineffective as a pressor agent but when combined with pholedrine it had a powerful pressor effect.

A number of illustrative case reports are presented.

JOHN L. LINDQUIST, M.D.

Ansbro, F. P., and Pico, L. J.: Continuous Spinal Anesthesia. Report of 100 Cases in Which This Method Was Employed. *Am. J. Surg.*, 1942, 55: 504.

In 105 operations (breast—1, gastrointestinal—40, biliary tract—15, hernia—20, gynecology—15, amputation—5, orthopedic—5, and genitourinary—4) satisfactory anesthesia was obtained in every case regardless of duration with the use of spinal anesthesia administered in small doses intermittently. The authors suggest the term "fractional" spinal anesthesia for this method since it may be used for operations of short or long duration with the drug administrations regulated to the requirements of the operation. However, in the literature the method is known as "continuous" spinal anesthesia.

Continuous spinal anesthesia is based on the findings of Lemmon of Philadelphia, that in the one-dose method of anesthesia a small amount of the total injected anesthetic solution is used. The balance of unused solution is idle until the fixed fraction has been used up. During this period it is subject to absorption by the circulation around the arachnoid. It is this absorbed solution that produces the toxic effects often noted when one large dose is injected. The best drug for spinal anesthesia is novocaine on the basis of its low toxicity. The disadvantage of novocaine is its short duration of action. By the continuous spinal method the disadvantage of the short action of novocaine is overcome as well as the possibility of producing toxic effects by the injection of a greater amount of solution than can be utilized by the nervous tissue in the arachnoid in a given length of time.

The preanesthetic medication of the patient is as important as the spinal anesthetic. The adult patient of 150 lb. and with a normal metabolism is given 3 gr. of pentabarbital sodium the night before operation and also the following morning three hours before operation, unless there is a known idiosyncrasy to the drug. The barbiturate protects against toxic reactions, diminishes the risk, suppresses convulsions and interference with the respiration by the cocaine series of drugs. One hour before operation ⅓ gr. of pantopon is given. Scopolamine hydrobromide (levoscopine tropate) is combined with this opiate in the proportion of 25 to 1. The combination of pantopon and scopolamine has its maximum action in one and one-half hours and lasts from three to five hours when effects on circulation, respiration, and analgesia are considered. During the course of the operation opiates are given with or without scopolamine if the nervous state of the patient demands it. These drugs may be given intramuscularly or, if quick action is desired, intravenously; and the injections are repeated if necessary to produce the proper somnolent state of the patient which should obtain during spinal anesthesia.

One per cent novocaine with ¾ gr. of ephedrine is used for a skin wheal. A spinawl is then used to puncture the skin and the muscles of the vertebral column. With a No. 18 needle inserted through the puncture wound made with the spinawl, 10 cc. of spinal fluid are withdrawn. The spinal fluid is then mixed with the novocaine to make the desired solution concentration. A 5 per cent solution is generally employed for upper abdominal work, a 3 per cent solution for lower abdominal work, and a 1 or 2 per cent solution for breast or intrathoracic work. If an additional quantity of solution is desired, it may be made up either with distilled water or with spinal fluid which may be withdrawn through the syringe and mixed with more novocaine. After the solution is made to the desired percentage the syringe containing it is connected to two feet of rubber tubing with a narrow lumen which just holds 2 cc. of solution. After the lumen of the tube is filled it is connected to the needle in the spine and slight barbotage is effected to determine if there is a free flow between the subarachnoid space and the syringe. If the flow is free, a fractional amount is injected into the subarachnoid space, and the patient is returned to the supine position and kept flat for abdominal work, or placed in the Trendelenburg position for chest work. As the operation proceeds, fractional doses are added as needed (usually in 50 mgm. amounts). Degrees of anesthesia as well as lengths of anesthesia are thus obtained. Just enough novocaine is added to produce the desired depth of anesthesia. Spinal fluid is absorbed and reformed six to seven times in twenty-four hours; hence the novocaine injected is fairly rapidly removed from the subarachnoid space and frequent replenishment is indicated. The drop in blood pressure under continuous spinal anesthesia is notably less than in other methods of spinal anesthesia. If the systolic blood pressure is below 150 mm. of mercury, ¾ gr. of ephedrine is given before anesthesia. If above 150 mm. of mercury, the spinal injection is given first and the ephedrine a few minutes later. In only 3 per cent of the cases was it necessary to give additional ephedrine. The average variation of blood pressure was between 25 and 50 mm. of mercury.

If alarming toxic symptoms develop from injection of the novocaine solution, one can withdraw the cerebrospinal fluid (from 3 to 6 cc.) with the fractional technique. It has been noted that the nerves recover promptly from the anesthesia. Headache is an incident in only 2 per cent. Urinary retention was present in 4 per cent. There were 3 instances of pulmonary atelectasis, which made an incidence of 3 per cent. There were no transient palsies or permanent paralyses. There were no instances of vertebral arthritis.

MANUEL E. LICHTENSTEIN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Lingley, J. R.: The Significance of Psammoma Calcification in the Roentgen Diagnosis of Papillary Tumors of the Ovary. *Am. J. Roentg.*, 1942, 47: 563.

Calcification in the form of psammoma bodies is practically limited to the benign cystadenoma of the ovary and the more malignant form of the same tumor, the papillary cystadenocarcinoma. The literature dealing with this condition is reviewed briefly and 5 cases which have come under the author's observation are reported. His experience with these cases leads him to believe that the roentgen appearance of this type of calcification is sufficiently characteristic to suggest the presence of such tumors.

The most striking roentgenographic feature is the density of the partially calcified masses. The characteristic density is less than that of most calcifying conditions of the abdomen. The psammoma bodies being extremely minute, and being fairly uniformly distributed throughout the neoplastic mass, produce a hazy shadow which is often only slightly more dense than the normal soft tissues. Other masses of the same tumors, however, may show a much greater degree of calcification which results in bizarre shadows with sharply defined margins and a density which approximates that of calcium stones in the kidney.

The second unusual feature of psammoma calcification in some of these cases is its remarkable extent. The partially calcified masses have filled the pelvis and multiple large and small calcifying masses have been found throughout the entire abdomen. When the process is as extensive as this, there is no other condition with which it can be confused. Smaller masses, however, must be differentiated from other calcifying lesions of the abdomen. The diffuse hazy calcification of psammoma bodies is the diagnostic feature which distinguishes papillary tumors of the ovary.

A. Hartung, M.D.

Buxton, B. H., Hunt, R. R., and Potter, C.: X-Ray Localization of the Placenta. *Am. J. Obst. & Gynec.*, 1942, 43: 610.

By the soft-tissue technique of Snow and Powell the authors have been able to localize the placenta in 86.1 per cent of the 108 cases in which this procedure was employed. Seventy-four of the placentas were fundal, on the anterior or posterior wall, and 19 lay wholly or in part in the lower uterine segment. In 9 cases no placenta was seen, and in 4 there was uncertainty regarding the significance of the shadows. In 7 of the 9 cases in which no placenta was visualized, placenta previa was subsequently demonstrated by a second method of examination. The absence of the placental shadow strongly but not invariably suggests placenta previa.

A second method of examination is now employed only in those selected cases in which the soft-tissue x-rays either fail to reveal the placenta, or show it to lie partly in the lower uterine segment, or in cases which are equivocal. It consists of anteroposterior roentgenography of the pelvis done by a precision stereoscopic technique with 4 per cent sodium iodide in the bladder. In these films also a modified soft-tissue technique is employed. The soft-tissue space lying between the presenting part and the filled bladder measures from 1 to 2 cm. in thickness. In central placenta previa the interposition of the placental mass may increase the distance to 5 or 6 cm. With marginal or partial placenta previa, there is unilateral widening, anteriorly, posteriorly, or laterally.

The amount of sodium iodide used in the average case is 125 cc.; in some cases 200 cc. are used. The occasional resultant overlapping of the bladder and skull shadows has been overcome by the use of only 4 per cent sodium iodide instead of the usual 12.5 per cent. This not only does away with bladder irritation, but produces a translucent shadow, through which the fetal skull can readily be seen. It also produces a double bladder shadow, and throws the anterior and posterior horns into relief.

The routine in managing cases with bleeding in the last trimester includes hospital admission, immediate blood-typing, and cross-matching. No enemas or colonic flushes are given, nor is the patient examined rectally or vaginally. Soft-tissue films are obtained and, if indicated, cystograms are made.

Edward L. Cornell, M.D.

Pohle, E. A.: Radiation Therapy in Carcinoma of the Esophagus. *Mississippi Valley M. J.*, 1942, 64: 45.

This is a brief report of a case of carcinoma of the esophagus which occurred in a white female, fifty-seven years of age, and which is still free of recurrence seven years following the administration of external roentgen therapy and intraesophageal radon seeds.

The case is interesting from several points of view. First, it represented a histologically proved squamous-cell carcinoma in the upper end of the esophagus which not only recurred several times locally but also produced enlargement of one of the cervical lymph nodes, most probably metastatic in nature. Second, the roentgen irradiation had to be interrupted several times because of the rather severe local reaction so that the dose in each series remained relatively small as compared to the technique used at present. Third, the eradication of the carcinoma was undoubtedly the result of implantation of radon seeds into the local neoplasm. Altogether 10 gold radon seeds (0.9 mc. each) were implanted interstitially. The roentgen therapy included both cer-

vical regions in addition to the site of the primary growth. Some mechanical dilatation of the esophagus was required after the completion of the radiation series.

Considering the fact that carcinoma of the esophagus is one of the most hopeless lesions from the therapeutic standpoint, this case is noteworthy.

T. LEUCUTIA, M.D.

RADIUM

Ahumada, J. C., and Chevalier, R. M.: Rectal Injury from Radium Irradiation (Rectopatías actinogenéticas). *Rev. méd. lat. amer.*, B. Air., 1942, 27: 437.

Unless radiotherapy of cancer of the cervix is very carefully carried out there may be injury to the mucosa of the rectum, which is very radiosensitive. This may happen from crossfire from two vaginal foci. The authors discuss 16 cases of this form of injury, 13 of them seen in the Gynecological Clinic of Buenos Aires, 1 seen in private practice, and 2 from other hospitals. The 13 seen at the Gynecological clinic occurred among 290 cases of radium irradiation, that is in 4.48 per cent of the cases.

The average time between the irradiation and the beginning of rectal symptoms was five months; the course of the disease varied from four months to a year. The symptoms were pain, loss of weight, fever, proctorrhagia, tenesmus, and diarrhea, or constipation in 25 per cent of the cases. Rectosigmoidoscopy showed telangiectasis and in the more advanced cases ulceration. Rectosigmoidoscopic and roentgenographic pictures are given and photomicrographs of the histological findings. Roentgen examination showed constriction of the lumen of the rectum with abolition of the mucosal folds and ulceration.

The prognosis of the lesions in themselves is not serious. Biopsy is not always necessary; it is needed only to exclude malignancy. It may cause serious hemorrhage. Treatment consists of suitable diet, the usual tonic and postradium treatment, care for daily evacuation, analgesics, and, if necessary, opiates and the use of daily enemas to wash out pathological secretion and prevent constipation. If there is intense tenesmus, enemas of 60 cc. of olive oil with 12 gm. of bismuth may be given. If there are fistulas into the vagina appropriate treatment for the secondary colpovestibulitis should be given. Strictures should not be dilated as dilatation is dangerous. The strictures are not serious and often are corrected spontaneously.

In this series there were 10 cures and 3 deaths, all from extension of the tumor for which the irradiation was given. Stricture remained for a time in 5 cases, and there was temporary fistulization in 1 case. In exceptional cases, if pain and proctorrhagia are intense, a temporary artificial anus may be justifiable. This operation was performed in 1 of these cases.

AUDREY G. MORGAN, M.D.

MISCELLANEOUS

Goldburgh, H. L., and Baer, S.: Death After the Intravenous Use of Diodrast. *J. Am. M. Ass.*, 1942, 118: 1051.

Although numerous toxic effects from diodrast and similar preparations used for excretory urography have been reported, as well as arterial and venous thomboses, fatalities following the intravenous use of these preparations have been exceedingly rare. Some of the fatalities are cited by the authors, and they present a case of their own which suffered a fatal anaphylactic reaction.

This patient, a woman sixty-seven years old with a history of uncontrolled diabetes, hypertensive heart disease, and degenerative arthritis of many years' duration, was subjected to urography because of a palpable tender kidney. Several days later she developed an asthmatic attack which subsided after forty-eight hours. Because the first examination was not entirely satisfactory it was decided to repeat it. A few drops of diodrast, placed under the tongue, elicited no reaction; 25 cc. of 35 per cent diodrast was then injected in a period of seven minutes. Within five minutes the patient became deeply cyanotic and had a convulsive seizure. Unconsciousness developed and respirations gradually decreased although the pulse was still perceptible. Despite all attempts at resuscitation, including the use of epinephrine and artificial respiration, the patient died within twenty minutes of the beginning of the injection. Two features particularly noted at death were the deep cyanosis and the well defined hepatomegaly.

In view of their experience, the authors believe that extreme caution should be exercised in the intravenous use of diodrast and similar preparations in patients with a history of asthma or sensitivity to iodine.

A. HARTUNG, M.D.

MISCELLANEOUS

CLINCIAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Duncan, G. W., and Blalock, A.: The Uniform Production of Experimental Shock by Crush Injury. Possible Relationship to Clinical Crush Syndrome. *Ann. Surg.*, 1942, 115: 684.

Reports have appeared in which extremities were compressed for a number of hours by heavy objects. Most of the patients in fairly good condition at the time of their release from the compression, usually developed shock within a few hours. After a period of hours or days, the patient developed signs of progressive renal damage. The output of urine diminished, nitrogenous materials were retained in the blood, and the urine showed albumin and granular casts.

So-called crush-syndrome experiments were performed on dogs. Compression was produced by placing a limb between two boards on the inner surfaces of which uneven strips were fixed and so arranged that a pressure of 500 lbs. was applied for five hours.

1. Half of the animals were given no treatment after release of the compression. All of them died except 1. The average duration of life in this group was seven and one-half hours. Nonprotein nitrogen showed an average increase of 44.8 mgm. per cent.

2. The other half of the animals were treated by the application of a pneumatic rubber cuff to the injured extremity upon release of the compression. A pressure of 40 mm. of mercury was applied to the extremity for from thirteen to eighteen hours. The average survival time of these animals was twenty-six and three-tenths hours when the cuff remained on for eighteen hours. RICHARD J. BENNETT, JR., M.D.

Wells, D. B., Humphrey, H. D., and Coll, J. J.: The Relation of Tannic Acid to the Liver Necrosis Occurring in Burns. *New England J. Med.*, 1942, 226: 629.

The sequence of clinical events resulting from a severe burn consists of primary reflex shock, secondary shock, toxemia, and sepsis. This article is primarily devoted to a clinical and experimental study of the toxic phase of the burn syndrome.

The authors presented 4 patients who died as a result of the toxemia, and indicated that the only significant histopathological finding was a hepatitis characterized by central necrosis of the hepatic cells of the liver lobule. The relationship of tannic acid to this constant pathological finding was suspected and investigated experimentally. Seventy-seven rats maintained either on a standard or house diet were given subcutaneously one or more injections of a 5 or 10 per cent solution of tannic acid. The livers of these animals showed varying degrees of liver necrosis depending on the amount and the frequency of the injection of tannic-acid solution. The microscopic findings also included central necrosis, all stages of cell degeneration, hemorrhage, and leukocytic infiltration. The authors claimed, therefore, that the toxemia of burns was effected by the use of tannic acid and resulted in liver damage.

BENJAMIN G. P. SHAFIROFF, M.D.

Ratish, H. D., Shackman, N. H., and Bullowa, J. G. M.: The Pharmacodynamics of Sulfadiazine in Man. *New England J. Med.*, 1942, 226: 596.

Sulfadiazine, an analogue of sulfapyridine, has recently been synthesized. In the human body it is readily absorbed from the gastrointestinal tract, and blood concentrations obtained are generally higher than those observed with similar doses of sulfapyridine and sulfathiazole. Sulfadiazine disappears from the blood more slowly than does either of the latter drugs. The amount conjugated in the blood is less than that of sulfapyridine or sulfathiazole and the conjugated fraction in blood and urine does not increase with continued administration. In the urine, about a third is found to be conjugated, although in exceptional cases a much larger proportion may be excreted in this form. Rapid urinary excretion of the drug may account for the small quantities of conjugated sulfadiazine in the blood.

When both rapid attainment and maintenance of high blood levels are desirable and oral administration is not feasible, the intravenous infusion of sodium sulfadiazine is practical. Blood concentration may be varied either by adjustment of the concentration of the infusion liquid, or by regulation of the rate of flow. Although the immediate levels obtained with the slow infusion method are somewhat lower than those obtained with the rapid intravenous injection of a similar dose, a high concentration is more readily maintained. This method is safe, flexible, and efficacious.

Sulfadiazine is widely and readily distributed in body fluids. It penetrates well into the pleural and peritoneal cavities. Concentration in the spinal fluid is usually about two-thirds that in the blood.

With initial doses of 2, 3, 4, and 5 gm. of sulfadiazine followed by 1 gm. every six hours, levels are obtained that are similar to those reached when the drug is given every four hours. Blood concentrations are independent of the total dose and the dose per kilogram of body weight. The incidence of toxic reactions is less with sulfadiazine than with sulfapyridine and sulfathiazole, and when reactions occur they are mild. MANUEL E. LICHTENSTEIN, M.D.

Hartzell, J. B., and Crowley, R. T.: Vitamin Therapy in the Surgical Patient. *Am. J. Surg.*, 1942, 56: 288.

Recently both experimental and clinical observations have emphasized the importance of adequate

vitamin maintenance in the treatment of diseases wholly surgical in nature.

The authors summarize and correlate the known facts about the vitamins and their relation to the surgical diseases.

All the vitamin complexes are divided arbitrarily into two groups: (1) vitamins necessary for the maintenance of health and normal nutrition but of which a deficiency is not of surgical importance; (2) vitamins necessary for health and normal nutrition of which a deficiency increases surgical risk.

Vitamin deficiencies are not always grossly apparent and there are many individuals who have subclinical deficiencies. Every surgical patient, therefore, should be observed with this thought in mind, and particularly those patients in the following classifications:

1. Patients on restricted dietary regimes, e.g., those with diabetes, peptic ulcer, and obesity.

2. Individuals taking drugs which inhibit absorption or destroy the ingested vitamins. Excessive ingestion of mineral oil prevents absorption of the fat soluble vitamins, A, D, and K. Excess of alcohol results in decreased ingestion of all food and the B complex in particular.

3. Individuals with disease of the gastrointestinal tract which prevents the absorption or utilization of vitamins. An example of this is Vitamin K deficiency in gall-bladder disease because of lack of bile for the emulsification and subsequent absorption of fatty substances.

VITAMIN FACTORS OF MINOR IMPORTANCE IN SURGICAL TREATMENT, VITAMINS A, D, AND E

Vitamin A. This is a fat-soluble, water-insoluble, crystalline, primary alcohol closely allied to the compound β Carotene. It is manufactured from this substance in the liver.

Two important physiological activities depend upon it: (1) visual adaptation to darkness, which depends on the speed of breakdown and resynthesis of visual purple; and (2) the integrity of the epithelial structure. A deficiency causes skin and corneal lesions, susceptibility to respiratory-tract infections, urinary calculi, and gastrointestinal afflictions.

The average daily minimum requirement is in the neighborhood of 2,000 units. The international unit represents the physiological activity of .006 mgm. of purified β carotene.

Vitamin D. This vitamin is a fat-soluble, sterol-like substance produced by the irradiation with ultraviolet rays of any one of a number of sterols such as ergosterol, tachysterol, or 7-dihydrocholesterol.

Two of these substances have a similar action. They aid in regulating the body level of calcium by facilitating its absorption from the gastrointestinal tract, and apparently are capable of producing excretion of phosphorus from the kidney.

Dihydrotachysterol has its greatest effect on calcium excretion. It produces a marked increase of phosphate excretion by the kidney with a concomitant renal excretion of calcium.

A deficiency of Vitamin D causes a decrease in the calcium salts of bone with consequent deformities. The daily average requirement varies from 200 to 1000 units depending on the case. In severe deficiencies 20,000 to 20,000 units may be required.

The international unit represents the physiological activity of .0025 mgm. of crystalline calciferol (irradiated ergosterol).

Vitamin E. This is a fat-soluble substance existing in several tocopherol forms. Its effects in the human have not been substantiated. In rats its deficiency is shown by its effect on gestation and on striate muscle.

VITAMIN SUBSTANCES OF MAJOR SURGICAL IMPORTANCE

Vitamin K. The discovery and clinical application of this vitamin represents one of the major advances in medical research. It is a fat-soluble compound containing a quinone structure that is present in a wide variety of plant and animal substances. The function of Vitamin K is to provide an element in the formation by the liver of an essential blood-clotting factor, prothrombin. The formation of the clot will be recalled by the equations: thromboplastin + prothrombin + calcium = thrombin; thrombin + fibrinogen = fibrin (clot).

A deficiency of Vitamin K, therefore, results in a prolonged clotting time. This may occur in any of the following conditions: (1) insufficient Vitamin K in the diet (a rare cause); (2) impaired absorption resulting from (a) insufficient bile for conversion into an absorbable state; (b) abnormalities of the absorptive intestinal surface; and (3) impaired liver function. The second group is the most important and includes (1) cases of simple exclusion of bile from the gut because of biliary fistula; (2) cases with obstruction from stones, strictures, tumors, or inflammatory processes; (3) cases of inadequate absorption due to diarrhea, ulcerative colitis, sprue, vomiting in intestinal obstruction, prolonged gastroduodenal drainage, gastrocolic fistula, and enterostomies; and (4) cases of primary hepatic damage, as in obstructive biliary cirrhosis and advanced acute or chronic parenchymatous disease.

The fat-soluble substances containing Vitamin K require bile or bile salts for their absorption from the intestine. If this is absent because of disease it must be supplied therapeutically. Water-soluble compounds containing the K principle may be had. They are given parenterally.

Vitamin B. This is not a single chemical nor biological entity but is separable into a number of components, the three most important of which (thiamine, riboflavin and nicotinic acid) are considered here.

Thiamine is a white, water-soluble, organic compound formed by the union of a pyrimidine and thiazole nucleus. It is of importance in the metabolism of carbohydrates. Its deficiency results in a

syndrome (beriberi) chiefly referable to the nervous and cardiovascular systems, with cardiac enlargement and irregularities and peripheral neuritis. The daily average requirement is 30 international units. A unit is the physiological effect of 0.003 mgm. of crystalline thiamine. A heightened metabolism increases the destruction of the vitamin by the tissues and larger amounts are necessary for the maintenance of normal function.

Therapeutic indications for the use of thiamine in the surgical patient include:

1. Preoperative preparation of alcoholics.
2. Postoperative cases in which anorexia interferes with normal recovery.
3. In surgery of the gastrointestinal tract because a deficiency results in intestinal atony.
4. In thyrotoxicosis because of the increased destruction of the vitamin.

Riboflavin is a yellow, crystalline, water-soluble substance formed by the organic union of the chromophoric nucleus flavin with a sugar a-ribose. Its deficiency produces a specific type of cheilosis and ocular manifestations. The daily requirement is 2 to 3 mgm. Indications for its use in relation to surgery are lacking.

Nicotinic acid is a white, water-soluble, crystalline powder of basic pyrimidine structure. It is chemically allied to nicotine but is not similar pharmacologically. A deficiency causes pellagra. The daily requirement is from 150 to 300 mg. Specific therapeutic indications in surgery are not definite.

Vitamin C. The clinical picture (scurvy) associated with a deficiency of this vitamin has been known a long time, but its specific relation to the repair of injured tissue has been appreciated only recently.

It is a water-soluble, crystalline substance of acid form to which the name ascorbic or cevitamic acid has been given. It is present in large amounts in the citrus fruits.

There exists a test for its quantitative determination. Its normal blood level is between 0.5 and 1.0 mgm. Levels below 0.15 are associated with manifest clinical signs.

There is an increased rate of destruction in certain infections, pregnancy, cancer, peptic ulcer, and hyperthyroidism.

In deficiency states the collagen intercellular substance of all fibrous-tissue derivatives, including blood vessels, skin, cartilage, bone, and teeth, is so altered that there is marked derangement in structure and function. For this reason the healing of wounds is profoundly disturbed. Collagen is not formed from its precursors and the intercellular material does not mature, so that normal tensile strength of the scar is not acquired. In addition, the proliferating connective-tissue cells remain in a state of immaturity.

Investigation of the Vitamin C status is therefore urged in: (1) all instances in which a deficiency is apparent; (2) all cases of major surgery; (3) all cases with a history of chronic gastrointestinal disease; (4) cases of delayed healing in which there is no obvious cause; (5) instances of voluntary dietary restriction; and (6) diseases in which there is a rapid depletion of Vitamin C body content.

When no deficiency exists a daily intake of 120 mgm. of ascorbic acid is adequate. In marked deficiency a dosage of 1,000 mgm. daily for three days followed by a maintenance dose of 120 mgm. daily will usually suffice. ROBERT D. MANSFIELD, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Yen, C. H., and Hsu, Y. K.: Isolation of a Virus from a Case of Acute Poliomyelitis in Peiping, with Histopathological Studies. *Chinese M. J.*, 1941, 60: 199.

This case report represents an effort on the part of the authors to stimulate interest and medical investigation on acute poliomyelitis in China. Since 1913, there has not been a single report of a pathological investigation of a case of poliomyelitis in China.

The authors succeeded in isolating a substance from a white girl who had died of the infection in Peking and in transmitting the filterable virus to a monkey. After a short virulent course of disease, the monkey died of apparent acute poliomyelitis. The diagnosis of the disease in the girl and monkey was verified by adequate pathological and bacteriological study.

Since this disease is reputed to be nonepidemic in China, isolation of this virus presents an opportunity to compare it with other strains, and thus determine whether the absence of acute poliomyelitis represents a nonvirulent infective agent in China or merely lack of attention, on the part of the epidemiologists, to subclinical infections. The authors raise the remote possibility that racial resistance to poliomyelitis may be an inherent characteristic of the Chinese race. STANLEY ROBBINS, M.D.

Warthen, H. J.: Gas Gangrene. A Review of 71 Cases. *Ann. Surg.*, 1942, 115: 609.

During the ten-year period from January, 1931, to January, 1941, 71 cases of gas gangrene were treated at the Medical College of Virginia Hospitals. Of the 71 patients treated, 21 died, a mortality of 30.9 per cent.

For the basis of comparison, the cases were divided into 2 five-year groups. This division was made because of the more varied type of therapy employed during the last five years as compared with that of the first five years. Larger prophylactic and therapeutic doses of perfringens antitoxin, roentgen therapy (prophylactic and therapeutic), and sulfanilamide, given locally and generally, were all widely used during the latter five years, in addition to the usual surgical measures of débridement, and amputation when indicated. In spite of the intensity of treatment, the mortality in 35 cases during the last five years was 40 per cent, as compared to a mor-

tality of 22 per cent in 36 cases treated during the first five years. The author attributes this increase in mortality to two possible factors; namely, a greater percentage of patients over the age of sixty, and the tendency to relax the care taken in the débridement with the advent of chemotherapy.

The results of the prophylactic and therapeutic procedures employed are summarized as follows:

	Mortality Per cent
Roentgen therapy (prophylactic and/or therapeutic)	33.3
Therapeutic perfringens antitoxin	30.9
Sulfanilamide (locally and/or generally	30.8
Prophylactic (10,000 U.) perfringens antitoxin	29.3
Débridement	28.5
Prophylactic (1,000-2,000 U.) perfringens antitoxin	26.3
Amputation	18.2

It is pointed out that perfringens antitoxin seems to have little effect on the prevention or cure of gas gangrene. Massive doses (up to 30,000 units) of the antitoxin were administered prophylactically and therapeutically. The results were disappointing.

Roentgen therapy proved of little value as a prophylactic or therapeutic measure in 18 patients. However, 35 additional cases in which roentgen therapy was given prophylactically failed to develop gas gangrene, which is regarded as encouraging.

In spite of the various types of therapy instituted, no single agent or drug proved specific in treating gas gangrene. In traumatic cases, an early, painstaking débridement is of greater value than any other procedure in preventing gas gangrene. Every traumatic case in which the deep fascia is penetrated is considered a potential gas-bacillus infection and treated accordingly.

This includes a painstaking clean-up with sterile water, green soap, and shaving, followed by ether, iodine, and alcohol. Purposeful débridement is then undertaken under aseptic technique, no nonessential tissue which has been exposed to the injury being permitted to remain. All foreign material and devitalized bone is removed. A copious, warm, normal saline irrigation is carried out in all parts of the wound. Ten grams of sulfanilamide are placed in the wound if the wound is closed. If tension exists, the wound is packed open and 20 gm. of sulfanilamide are inserted into it. A sympathetic novocaine injection is given if the circulation is impaired. Perfringens antitoxin may be given, and prophylactic roentgen therapy should be given every twelve hours.

If gas gangrene develops, an immediate débridement or open amputation should be done. Roentgen therapy and sulfanilamides should be continued. Roentgenograms are helpful as an early diagnostic measure. LUTHER H. WOLFF, M.D

Cutting, W. C., and Sultan, E. H.: Sulfonamides —Passage into Spinal Fluid and Rectal Absorption. *Ann. Int. M.*, 1942, 16: 708.

Sulfathiazole when given by mouth was found to enter normal spinal fluid to a concentration of only about 20 per cent of the simultaneous blood concentration; roughly, twice this concentration would penetrate through inflamed meninges. Sulfapyridine and sulfanilamide penetrated more efficiently into the spinal fluid in meningitis, as the concentrations in the spinal fluid approached the blood levels of these drugs.

Rectal absorption of sulfapyridine and sulfathiazole was practically nil in dogs and patients. Rectal absorption of sulfanilamide, although variable, was always considerable, and when low blood concentrations will suffice, rectal administration may be a valuable method for treatment with this drug.

J. M. MORA, M.D.

Rammelkamp, C. H., and Keefer, C. S.: Sulfadiazine; A Study of Its Effect on Hemolytic Streptococci. *Ann. Int. M.*, 1942, 16: 659.

Preliminary studies indicated that sulfadiazine was superior to either sulfanilamide or sulfapyridine in the treatment of experimental infections in mice, due to either the streptococcus or pneumococcus. Reports of other investigators demonstrated that sulfadiazine is readily absorbed from the intestinal tract and that higher concentrations are not only reached but are maintained for longer periods with sulfadiazine than with either sulfanilamide or sulfapyridine. There is little or no conjugation and toxic reactions are much fewer. Diffusion to pleural or ascitic fluids as well as to the subarachnoid space will vary in amount from 50 to 94 per cent of the level in the blood.

The experiments reported were divided into groups: those in which the drug was received by mouth and those in which it was added to normal defibrinated blood. Human beings were used as the source of blood in all experiments. One-tenth of various saline dilutions of test organisms was added to 0.5 cc. of the defibrinated blood containing varying concentrations of the drug. Eight different dilutions of organisms were added to each sample of blood. The tubes were then rotated in an incubator for twenty-four hours, at the end of which time the tubes showing no hemolysis were plated out and the colonies counted. The tubes showing no hemolysis contained between 10^{-7} and 10^{-8} organisms per cubic centimeter. Five strains of organisms were used. These all showed beta hemolysis and belonged to Lancefield's Group A.

Thirty experiments were performed on samples of blood taken from human beings who had received sulfadiazine orally. The concentration following a single oral dose of 4 gm. varied between 2.6 and 10 mgm. per 100 cc. In every instance a bactericidal effect was observed, regardless of the dilutions of inoculum. This is in striking contrast to previous observations on sulfanilamide in which it was observed that a similar effect was obtained only when natural antibodies were present or when the number of organisms in the inoculum was very small.

Observations on the effect of varying concentrations of sulfadiazine in the blood following oral ad-

ministration showed that even when this concentration was only 0.8 mgm. per 100 cc., it possessed definite bactericidal properties. These experiments also showed that as the blood concentration was raised to 5.6 mgm. per 100 cc. of blood, it possessed a greater killing power. Maximum bactericidal effect was obtained with a concentration of from 4 to 5 mgm. per 100 cubic centimeters.

In comparing the effect of the presence of antibodies on the action of sulfadiazine against streptococci it was found that a concentration of 3 mgm. per 100 cc. in blood with natural antibodies killed an inoculum containing 1,800,000 organisms per cubic centimeter, while in blood containing no antibodies an inoculum of only 1,000 organisms was killed when the concentration of the drug was 4 mgm. per 100 cubic centimeters. This indicates that sulfadiazine greatly enhances the bactericidal effect of whole blood containing natural antibodies.

In another series of experiments sulfanilamide and sulfadiazine were added to normal defibrinated blood. These samples of blood were then diluted with normal blood so that varying concentrations of the drug were obtained. Eight dilutions of test organisms were then added to each concentration containing the two drugs. It was found that when the inoculum was 240,000 organisms per cubic centimeter of blood, the growth of the test organism was not affected by either drug until a concentration of the drug was above 10 mgm. per 100 cubic centimeters. At higher concentrations sulfadiazine exhibited a definite killing power. At lower concentrations both drugs exhibited a killing power for the organisms.

The authors conclude that sulfadiazine is bactericidal for the hemolytic streptococcus when the inoculum is small and the concentration is between 2 and 5 mgm. per 100 cubic centimeters. Its action is enhanced by the presence of antibactericidal antibodies, either natural or acquired.

ALFRED B. LONGACRE, M.D.

Lederer, M., and Rosenblatt, P.: Death During Sulfathiazole Therapy. *J. Am. M. Ass.*, 1942, 119: 8.

With the extensive therapeutic use of sulfathiazole, reports of untoward reactions have appeared in the medical literature. Many of these have been of a transient nature, while others have been more serious and have terminated in death. Cases studied at autopsy have not been many and post-mortem observations have been few.

The authors report 4 cases in which sulfathiazole appears to have played an important role, and in which lesions attributable probably to the action of the drug were found in various organs. From these cases, certain clinical conclusions can be drawn:

1. The indiscriminate and uncontrolled use of sulfathiazole is not without danger.

2. Examination of the urine during the course of therapy is important, since crystals of the drug in the urine and hematuria are danger signals. In their presence therapy need not be interrupted so long as the fluid intake and output are adequate. Sodium citrate, sodium bicarbonate, or some other alkaline salt may be given.

3. A chill occurring during the administration of sulfathiazole and followed by sustained fever should be regarded as a danger signal, and sulfathiazole therapy should be discontinued at once.

4. Diminution and suppression of the urinary output should be considered a contraindication to further administration of the drug.

5. Blood concentration of sulfathiazole over 10 mgm. per 100 c.c. is undesirable unless the aforementioned precautions are observed.

6. Sulfathiazole should be used only when definitely indicated and should not be continued longer than is absolutely necessary.

NOAH D. FABRICANT, M.D.

DUCTLESS GLANDS

Marx, W., Simpson, M. E., and Evans, H. M.: Bicassay of the Growth Hormone of the Anterior Pituitary Lobe. *Endocrinology*, 1942, 30: 1.

This article reports the further standardization of the quantitative determination of the pituitary growth hormone. The basic technique proposed utilizes the increase in body weight in normal "plateaued" and hypophysectomized rats.

The accuracy of this procedure in the hands of the authors is shown to be high by virtue of (1) controlling all pertinent variables, (2) computing the errors that are inherent in any statistical method, and (3) considering the limitations of the assay method with particular reference to such imponderables as synergism and antagonism of the pituitary hormones.

STANLEY ROBBINS, M.D.

Burrill, M. W., and Greene, R. R.: The Capacity of the Rat's Liver to Inactivate Desoxycorticosterone Acetate. *Endocrinology*, 1942, 30: 142.

In contradistinction to the adrenal steroids, corticosterone, and dehydrocorticosterone, which are as effective orally as subcutaneously, desoxycorticosterone acetate is relatively ineffective when given by mouth. Eversole and Gaunt in a previous communication supported the view that the drug must be destroyed by the intestines as they had no evidence of hepatic inactivation.

The present report offers the directly contradictory evidence that liver inactivation is the sole cause for the ineffectiveness of the orally administered drug. Survival data on standardized adrenalectomized rats indicates that desoxycorticosterone acetate, in amounts sufficient to be effective subcutaneously, was not effective when implanted intramesenterically. This latter route demonstrated that despite an apparently equal quantitative absorption, animal survival was very poor. Three times as much was implanted mesenterically as subcutaneously but equality of the survival rates was not obtained.

Since the hormone absorbed from the intramesenteric route must pass through the liver, while the drug from the subcutaneous nodules enters the systemic circulation directly, the authors conclude that the liver must be responsible for the inactivation of the drug.

It was evident, however, that increasing the amount of drug intramesenterically three times improved the survival rate of rats; therefore it can be naerred that the liver is capable of inactivating only limited amounts of this substance and that large fimounts of the hormone must be given orally to render it equally effective as when given by mouth.

No explanation was offered by the authors for the disparity between their results and the previously mentioned results of Eversole and Gaunt.

STANLEY ROBBINS, M.D.

Gray, J. S., Wieczorowski, E., Wells, J. A., and Harris, S. C.: The Preparation and Properties of Urogastrone. *Endocrinology*, 1942, 30: 129.

Urogastrone is a water-soluble substance, obtainable from the urine of both dog and man, which effectively inhibits gastric secretion. Gray and his associates describe methods for the preparation of extracts containing this substance from normal urine. Chemical analyses indicate that the active agent is probably a complex organic base, yet neither a protein nor a polypeptide which is susceptible to the action of pepsin. Urogastrone is routinely assayed in dogs with pouches (vagotomized) of the entire stomach.

On intravenous injection into dogs with such pouches, total doses of less than 0.5 mgm. are capable of inhibiting the gastric secretory response to histamine. Urogastrone under these conditions is very effective in temporarily inhibiting the output of acid by the gastric glands. No inhibition is obtained when this substance is given orally. Urogastrone has been shown to be effective in inhibiting gastric secretion in man when given subcutaneously. The extracts produce an inhibition of gastric motility in dogs, but only if the vagi are intact. It is possible that separate factors are responsible for the motor and secretory effects.

The best available preparations inhibit also the pancreatic and biliary secretions, but not the salivary secretion. Doses of urogastrone which inhibit gastric secretion are without effect on the blood pressure. Multiples of this dose, however, are apt to produce a slight fall in the blood pressure which is very gradual in onset and recovery. Also, the preparations contain a factor which was found to produce a delayed local erythema upon subcutaneous injection in men. The active agent has been differentiated from a number of substances found in urine, including estrogenic and gonadotropic hormones, the principles of the posterior lobes of the pituitary gland, and the vasodilator, kallikrein.

In the authors' experience the output of urogastrone is much reduced in patients with peptic ulcer.

EDWIN J. PULASKI, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

McFarland, J.: The Histopathological Prognosis of Salivary-Gland Mixed Tumors. *Am. J. M. Sc.*, 1942, 203: 502.

McFarland gives a résumé of his findings in a study of mixed tumors of the salivary glands extending over a period of twenty years. He has collected 421 cases but the data is not complete on all. The glandular distribution was: sublingual, 2 cases; submaxillary, 12; and parotid, 380. The sex distribution was: males, 184; females, 212. There were 144 tumors on the right side, 147 on the left. He points out the difficulty in following up these cases and arriving at an accurate estimate of the date of recurrence, but the average period elapsing between operative removal of the primary tumor and the recurrence was seven years. If he bases his calculations only on the number of patients still alive and under observation, his percentage of possible recurrences is 48. If he bases it only on a total of 400 accepted cases with 100 known recurrences, it is 25.

He stresses the fact that different lobules of the same tumor will show widely varying histology. However, he has made an effort to group the tumors according to some plan upon which a prognosis can be determined from the cytology with some degree of accuracy. He has arranged them in four large groups with subgroups and into carcinomas. He gives seven tables of carefully compiled statistics on the percentages in each group, the recurrences, and the fatalities due to the tumor. The highest per cent of recurrences occurred in the papillary canicular group (81.8 per cent), and the next highest in the carcinomatoid group (76 per cent). Of a grand total of all varieties of 218 cases, 26 were fatal.

The author gave sections of 50 histologically varying tumors without identification to 25 competent microscopists, 5 of whom were professors of pathology, all others teachers of pathology or directors of hospital laboratories, for an opinion. Their prognosis proved correct in an average of 52 per cent of the cases. The single highest per cent of accuracy was 63. The author concludes that something more than a simple microscopic examination of the tissue will be required before anything approaching an accurate prognosis will be possible. MARIAN BARNES, M.D.

Stout, A. P.: Superficial Spreading Type of Carcinoma of the Stomach. *Arch. Surg.*, 1942, 44: 651.

Carcinoma of the stomach is classified into three groups: (1) the fungating tumor, which grows chiefly into the lumen; (2) the linitis plastica type of growth which runs parallel to the lumen in all its coats; and (3) ulcerated cancer, which develops at the margin of a pre-existing ulcer and grows chiefly toward the serosa. Stout now adds to these a fourth group, the growth starting in the mucosa and spreading superficially in the mucosa and submucosa without penetrating deeply into the muscularis until it has covered a considerable surface area. He reports 15 cases.

Grossly this carcinoma is characterized by reddening, irregularity, and slight nodular thickening of the diseased mucosa. Almost always this is associated either with a shallow bowl-shaped ulcer extending to the submucosa, or with a characteristic deep penetrating peptic ulcer, from the periphery of which the superficial tumor growth spreads outward in the mucosa and in the submucosa. Despite the fact that the tumors are superficial, it was observed when resection was performed that 7 of the 15 had already metastasized either to the superior or inferior gastric lymph nodes. Microscopically, the important feature, whether the tumor cells started from a single focus or from multiple foci, is the superficial spread. In the majority of cases the cancerous growth is associated with fibrous thickening of the gastric wall and hypertrophy of the muscular coat and pyloric ring muscle. In all, gastritis involved the mucosa and usually the other coats as well.

Clinically, most of the patients had long-standing ulcer histories and two-thirds of them had peptic ulcer, while 14 were noted to have more or less six-hour barium-meal retention (probably due to muscle spasm since in none of them was the muscle obstructed). Most had sufficient fibrosis to stiffen the gastric wall, and a disarrangement of the mucosal folds, sometimes with the formation of small mucosal nodules which could be visualized by roentgenograms and seen through a gastroscope.

Interest in and concentration on the diagnosis of early cancer of the stomach, particularly in the group suffering from ulcer symptoms, according to Stout, may account for the sudden appearance of the superficial spreading type of cancer in resected stomachs, and in all probability a larger number of cases will be brought to light. The results of treatment by partial gastrectomy have been gratifying. All the patients survived the operation; 1 died of cancer thirteen months after resection. Of the 14 survivors, 4 have passed three years, 3 are living between two and three years, 4 between one year and two years, and 3 less than 1 year after operation. All of these survivors are symptom-free. This type of superficial spreading carcinoma seemingly offers a far better hope of cure by surgery than the average.

EDWIN J. PULASKI, M.D.

EXPERIMENTAL SURGERY

Crowley, R. T.: Reflex Changes in Respiration Induced by Distention of the Small Intestine. *Arch. Surg.*, 1942, 44: 707.

"Marked respiratory changes, reflex in character, invariably follow excessive distention rapidly induced at any level of the small intestine of the anesthetized dog. These changes are of a characteristic pattern and are accompanied by synchronous fluctuations in the blood pressure. They are apparently initiated by afferent impulses arising from the stimulus of distention and mediated by fibers of the splanchnic nerve radicals to the distended bowel segment and subsequently by pathways in the spinal cord, since they are eliminated by complete section of either of these structures. The vagus nerves and the adrenal glands are not involved in the production of the respiratory and the blood pressure effects since these continue to appear after transection of the former and total extirpation of the latter. Drugs inhibiting the action of the efferent components of the autonomic nervous system, both adrenergic and cholinergic, exert little or no action on the respiratory alteration appearing on distention. Drugs depressing the visceral afferent impulses from the distended bowel segment lessen the respiratory and blood pressure phenomena and, if given in sufficient doses, abolish them entirely."

WALTER H. NADLER, M.D.

Rodbard, S., and Freed, S. C.: The Effect of Desoxycorticosterone Acetate on the Blood Pressure of the Dog. *Endocrinology*, 1942, 30: 365.

Daily injections of 20 mgm. of desoxycorticosterone acetate to normotensive, spontaneously hypertensive, and Goldblatt-hypertensive dogs led to elevations of the blood pressure in 9 of 12 animals.

In 2 of the previously hypertensive dogs, acute pulmonary edema developed and death ensued.

The blood-pressure changes after cessation of the injections of desoxycorticosterone acetate led a variable course; in some cases the elevated pressure remained for a considerable period, while in others it fell rapidly or slowly to the control pressure levels.

The fall in serum potassium attendant upon the administration of desoxycorticosterone acetate was not related to the blood-pressure elevation.

PAUL MERRELL, M.D.

Rugiero, H. R., and Tanturi, C. A.: Studies of Inflammation. Local Acidosis and its Relationship to Carbohydrate Metabolism (Estudios sobre inflamación. Acidosis local y su relación con el metabolismo hidrocarbonado). *Sem. méd.*, B. Air., 1942, 49: 577.

Acute inflammation of the pleura was brought about in dogs by the injection of turpentine. It was found that with increased glycolysis and consequent decrease of glucose in the exudate there was an increase in lactic acid and a movement of the pH in the acid direction. The lower the pH the greater the concentration of lactic acid and the lower the alkaline reserve. The network of fibrin and the lymphatic and capillary thrombosis prevent the escape of the acids formed locally, which increases the acid content of the free exudate and decreases the alkaline reserve. This brings about a change in the cells of the exudate also. When the pH is alkaline the predominant cell is the polynuclear leucocyte, and when the pH becomes acid mononuclears predominate. With a pH of 6.60 or lower the cells degenerate and the liquid becomes purulent. This shows that turpentine inflammation brings about a change in intermediate carbohydrate metabolism, which may be due to local anoxemia. With increasing dosage of the irritant there is an

increase in the changes in glucose, lactic acid, pH, carbon dioxide, and the local cell picture.

Graphs are given showing the findings in various cases. AUDREY G. MORGAN, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Watson-Jones, R.: Rehabilitation in the Royal Air Force. *Brit. M. J.*, 1942, 1: 403.

If injured men, either in service or civilian work, are left in large hospitals without rehabilitation, they may become morose and debilitated. When they are placed in the bright cheerful surroundings of the rehabilitation centers, they quickly show improvement.

The author describes in detail the personnel and equipment of such centers, and also the management of this class of patients. It is his opinion that the expense of maintenance is more than compensated by the rapidity of return to service of the injured. Typical cases are described.

JOHN J. MALONEY, M.D.

Cilento, Sir R.: A Salaried State Medical Service. *Med. J. Australia*, 1942, 1: 363.

The author favors a salaried State Medical Service in Australia and presents elaborations of representations made by him over a period of years to the National Health and Medical Research Council of the Commonwealth. He considers State control of medical care to be inevitable, gives his reasons for so concluding, and discusses various objections that have been raised to control of medical care by the State.

Medical care is an essential and the writer believes that maintenance of health must become the deliberate ideal of the State. Preventive and corrective medicine is an essential part of one scheme. The solution of present-day complexities of medical care is believed to lie in group practice. The corrective aspect of medicine in Australia is discussed in relation to areas of varied population density and a tentative scheme is presented to indicate the future of salaried medical officers. It is proposed that on graduation the junior or resident hospital medical officers begin to receive pay from the State, and detailed suggestions are made for ensuing years. Consultative squads would provide a connecting link between the hospitals and consultation centers which would serve as regional health centers. It is proposed that every medical man be eligible for service in the scheme which would, however, not be compulsory nor be inconsistent with private practice.

WALTER H. NADLER, M.D.

Howitt, F., and Wesson, A.: Army Physical-Development Center. *Lancet*, Lond., 1942, 242: 373.

The authors report upon the result and methods of the Army Physical Development Center, which has been developed in the British Army. This Center was developed to increase the available man power and an attempt was thus made to upgrade the substandard recruit of the army. The personnel selected were from the categories A-2, B-1, and B-2, under the age of thirty-five years. Medical officers from what evidently corresponds to our induction center recommended the men for this training. Specialists in physical medicine made the final selection. The course was of two months' duration and it was, therefore, necessary that only those likely to show substantial improvement should be sent. The disabilities found most likely to respond included poor physique due to underdevelopment and malnutrition; abnormality due to postural, occupational, and environmental causes; and local skeletal defects not associated with rigid deformity. Complete co-operation was necessary between the health and the education services.

It was found that specialists in physical medicine were eager to grasp the opportunity in closest touch with these physical training corps. Staff instructors in this course were given special courses in functional anatomy and the application of exercises in the treatment of deviation from the normal. On the successful completion of their course some of these instructors were sent to military hospitals and to convalescent hospitals so that it was possible, under medical supervision, to begin the process of active rehabilitation at the earliest possible moment, and to maintain continuity during the various stages of convalescence until the moment of final hardening had been reached.

It was found absolutely necessary that a happy atmosphere prevail over the entire Center. No amount of medical and physical treatment was found to be curative without co-operation and self-effort on the part of the trainee. The commandant addressed each new recruit upon his arrival and explained the opportunities and value of the work in which he was about to partake. Particular attention was paid to the prevention of fatigue. In the daily program the periods, of forty-five minutes' duration, were so arranged that the more strenuous sessions were alternated with those of a more recreational nature. A break was given in the midmorning, at which time the trainees relaxed on their beds for half an hour. Every attempt was made to prevent staleness and boredom. The timing of contraction and relaxation of the muscles was especially studied. The diet of the trainees was kept at the regular army diet except that a large cup of cocoa and milk was given in the morning. Sufficient caloric and vitamin intake was kept up. A great deal of importance was attached to skin stimulation. In the open a minimum of clothing was worn, shorts only, and most of the work was carried out with the patients in bare feet. A carbon arc was used a great deal. Care of the feet was especially important and special shoes were designed as well as active care of any deformity, hyperidrosis, corns, blisters, toe-nails.

The recreational period was devoted mostly to team games, which served the dual purpose of improving physique and stimulating mental activities.

A man often forgets a minor disability when playing football, during which he will gain a surprising degree of unconscious movement in the affected joints. In the later stages, roadwalk, cross-country walk, boxing, wrestling, and unarmed combat were used. Remedial physical training formed the basis of the work in the center. Exercises were designed to counteract atrophy of disuse, imbalance between muscle groups, limitation of joint movements, and habitual abnormalities of posture and gait. It was found that a series of groups, consisting of from 12 to 20 men, could work together in class work. Each member of the section, however, received additional individual instruction. The following were the types noted:

1. Malnutrition and underdevelopment: in this group the attention was given mainly to the development of larger muscle masses.

2. Postural abnormality: two common types were noted: (a) The forward slump with hyperextended knees and a down-tilted pelvis, and forward head, and (b) the sway-back in which the weight was carried more on the heels, the knees flexed, the pelvis horizontal, and an acutely forward head. Direction of posture had to be individual, but the final aim was balancing the body weight so that no undue tension was thrown on any of the weight-bearing joints and their ligaments and no excessive load was thrown on any one muscle group. Flatfoot was treated with active exercises and light agility work, as well as instruction in correcting the habits of standing and walking. Forefoot disabilities consisted of hallux rigidus and other painful conditions associated with faulty weightbearing. In this class exercises designed to promote mobility of the joints preceded normal foot exercises and re-educational walking. Other defects of locomotion were mostly results of injury to, or operations upon, the knee. Careful examination revealed which muscles required special training.

A number of cases of local disability were treated by faradism. These included mostly muscle weaknesses. Resisted exercises such as weight and pulley exercises were of value as additional localized exercises for weakened muscles. They were found to be of particular value in strengthening the strap muscles and the inverters of the foot. Constant supervision was found essential in all of the treatments involving muscular contraction in order to insure that a corresponding period of relaxation ensued. As the course was short and the program full there was little need of occupational therapy of a diversional type. A work shop, however, was supported on the grounds with gardening and carpentry. Education and mental stimulation were very actively kept up with current affairs, map reading, mathematics, and English and military geography being the most important subjects taught. Complete medical examination was checked up when the patient was admitted to the Center, and again at the third week. A final examination was carried out with the recategorization of the trainees. Exercise tolerance tests were carried out as well as estimations of the vital capacity. Certain fixed performance tests were carried out: 100 yard sprints, heaving a 16 lb. shot, long jump, and obstacle race. Physical efficiency tests such as heaving to the beam, rope climbing, balance work, and horse and ground work, as well as route marches were carried out. A march of at least 12 miles in full battle order must be completed without distress before a trainee can be considered 1-A.

The results of the first four courses, involving approximately 1,000 men, showed that 67 per cent were regraded into a higher category than that in which they arrived; and that 47 per cent were returned to their units as 1-A. A follow-up system was established in which officers' commanding units are required to forward reports of the subsequent physical behavior of the trainees in their new category. The results of this have not yet been observed. The following is a table showing the main groups and the percentages upgraded.

Main Groups	Percentage upgraded	Percentage reaching 1-A
Underdevelopment	75	60
Postural abnormalities	65	50
Flat-foot	72	55
Forefoot disabilities	30	20
Other locomotor defects	66	50

WILLIAM C. BECK, M.D.